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Primerjalna analiza jakosti in smeri podnebnih sprememb v Evropi od pliocena do antropocena

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Izvleček

Razumevanje paleo-podnebnih sprememb na Zemlji je ključno za pripravo globalnih podnebnih modelov, ki napovedujejo podnebje v 21. stoletju, hkrati pa te spremembe predstavljajo pomembno gonilo recentnih vzorcev biodiverzitete. V prispevku z vektorsko analizo (CVA) obravnavamo spremembe povprečne letne temperature zraka in količine padavin v Evropi na podlagi baz PaleoClim in CHELSA, od pliocena do konca 21. stoletja. Osredotočamo se na regionalne podobnosti in razlike v jakosti in smeri sprememb. Rezultati poudarjajo naravno dinamiko podnebja in služijo kot umeritev za napovedi prihodnjih sprememb, ki so osnova za trenutne in prihodnje prilagoditvene strategije v Evropi.

Ključne besede

povprečna letna višina padavin, povprečna letna temperatura zraka, Change Vector Analysis (CVA), Non-metric Multi-Dimensional Scaling (NMDS), Paleoclim, CHELSA

Abstract

A Comparative Analysis of Climate Change Magnitude and Direction in Europe from the Pliocene to the Anthropocene

Understanding paleo-climate changes on Earth is crucial for the development of global climate models that predict the climate of the 21st century, while these changes also serve as an important driver of recent biodiversity patterns. In this paper, we use Change Vector Analysis (CVA) to examine changes in average annual air temperature and precipitation in Europe, based on the PaleoClim and CHELSA databases, from the Pliocene to the end of the 21st century. We focus on regional similarities and differences in the magnitude and direction of changes. The results highlight the natural dynamics of the climate and serve as a calibration for future change forecasts, which form the basis for current and future adaptation strategies in Europe.

Keywords

mean annual precipitation, mean annual air temperature, CVA, NMDS, Paleoclim, CHELSA



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1 Uvod

Zemlja je dinamičen planet. Neprestano se spreminja od svojega nastanka naprej. Stabilna obdobja brez sprememb so na Zemlji bolj izjema kot pravilo. Slednje še posebej velja za njeno atmosfero. Srbski geofizik in astronom Milutin Milanković je pred stoletjem (1920) dokazal, da variacije v treh vrstah Zemljinih orbitalnih gibanj (ekscentričnost, nagib osi in precesija osi) vplivajo na to, koliko sončnega sevanja (insolacije) na različnih geografskih širinah doseže vrh Zemljine atmosfere. Tako velja pravilo, da Milankovičevi cikli, v srednjih geografskih širinah (30° do 60° severno in južno od ekvatorja), pojasnjujejo do 25 odstotkov variacije v prejeti insolaciji (NASA, 2020). Skupaj z drugimi naravnimi procesi na Zemlji (tektonika plošč, vulkanizem, razvoj živih bitij itd.) so omenjeni astronomski vzroki glavno gonilo paleo-podnebnih sprememb (Saltzman, 2002).

V prispevku po krono-sekvencah ($n=13$), vse od pliocena (pred 3,3 mio let) do konca 21. stoletja (2071-2100) obravnavamo jakost in smer sprememb povprečne letne temperature zraka [$v \text{ } ^\circ\text{C} \cdot 10$] in povprečne letne količine/višine padavin [$v \text{ mm}$] v širšem evropskem prostoru.

Številne študije paleo-podnebnih sprememb se, zaradi boljšega razumevanja dolgoročnih učinkov povišane koncentracije CO_2 v atmosferi, pogosto osredotočajo na geološko epoko pliocen (pred 5,2 do 2,6 milijona let) (Dolan idr., 2015; Lunt idr., 2010). Pozni pliocen predstavlja najbolj nedavni čas v Zemljini zgodovini, ko so bile temperature zraka višje od recentnih zaradi povišane koncentracije ogljikovega dioksida (CO_2) v atmosferi, ki je bila za 50 do 125 ppm višja od stanja v recentni predindustrijski dobi (Bartoli idr., 2011; Dowsett idr., 2010; Haywood & Valdes, 2004). Kljub temu je tudi v tem geološkem obdobju prihajalo do podnebnih sprememb. Med najpomembnejšimi je faza glaciacije M2 pred 3,3 milijona let (Dolan idr., 2015). Pliocenu sledil doba pleistocen, ki je trajala od 2,6 milijona let do 11.700 let pred sedanjostjo (Gradstein idr., 2020). Omenjena epoha je bila zaznamovana s hitrimi in intenzivnimi geomorfološki procesi, ki so bili posledica izmenjavanja toplih in hladnih obdobj, predvsem zaradi astronomskih vplivov (Milankovičevi cikli). Drastične ohlavitve v tem obdobju so vodile v ledene dobe, imenovane pleistocenske poledenitve (glaciali). Z ledom je bilo pokritega tudi do 30 % planeta, povprečna temperatura zraka pa je bila nižja za 10 °C v primerjavi z današnjo (Prothero & Dott, 2010). Daljšim obdobjem ledenih dob so sledila krajša obdobja s toplejšim podnebjem, imenovana medledene dobe (interglaciali), pri čemer je bila razlika v povprečni temperaturi zraka približno 8 °C (Bahar, 2020). Delež CO_2 se je gibal med 0,02 % v hladnih obdobjih (glacialih), ter 0,03 % v toplih obdobjih (interglacialih), kar predstavlja najnižji vrednosti atmosferske koncentracije CO_2 v Zemljini zgodovini (Bahar, 2020). Za holocen (pred 11.700 leti do danes), ki sledi pleistocenu, je značilen razvoj sodobne človeške družbe (Mayewski idr., 2004), ki postaja (je) pomembna preoblikovalka okolja (Crutzen, 2006). Prehod iz pleistocena v holocen je bil zaznamovan z močno in dolgotrajno otoplitvijo, ki se je začela s koncem zadnje ledene dobe pred 11.700 leti (Božič Nosan, 2020). Tudi holocen je podnebno dinamično obdobje, saj je skozi njegovo zgodovino prišlo do vsaj šestih hitrih podnebnih sprememb, ki so se kazale v polarnem ohlajanju, tropskih sušah ter velikih spremembah v atmosferskem kroženju (Mayewski idr., 2004). Kakorkoli, danes je glavni povzročitelj podnebnih sprememb človek. Antropogeno pospešene podnebne spremembe 21. stoletja so namreč posledica predvsem človekove ekonomske aktivnosti, vezane na izkoriščanje fosilnih goriv (Summerhayes & Zalasiewicz, 2018). Leta 2000 je atmosferski kemik Paul Crutzen vpeljal izraz antropocen, ki označuje

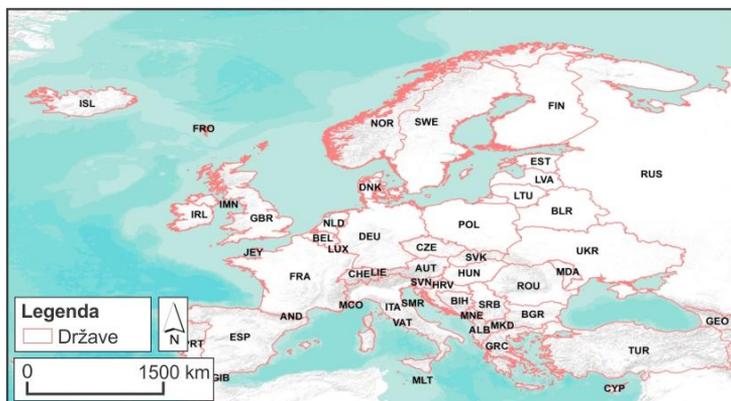
novo (neuradno) geološko epoko v kateri za glavno gonilno silo (podnebnih in okoljskih) sprememb velja človek. Po Crutzenu (Summerhayes & Zalasiewicz, 2018) bi se obdobje antropocen pričelo z zasnovo parnega stroja leta 1784. Globalna temperatura zraka se je od predindustrijskega obdobja (1860-1900) do danes povišala za 1,2 °C. Koncentracija CO₂ v ozračju v tem obdobju narašča za 20 ppm na desetletje, kar je 100-krat hitreje od večine porastov CO₂ v zadnjih 800.000 letih (Summerhayes & Zalasiewicz, 2018). Atmosferska koncentracija CO₂ je leta 2023 dosegla 420 ppm, kar je približno 130 ppm nad najvišjimi globalnimi atmosferskimi ravnimi CO₂ v preteklih interglacialih, koncentracija toplogrednega plina metan (CH₄) pa se je v enakem obdobju dvignila še za večji delež glede na pretekla medledena obdobja (Summerhayes & Zalasiewicz, 2018). Temperaturna anomalija 1,2 °C v letu 2016 je bila 0,4 °C nad povprečno globalno temperaturo, ocenjeno za holocenski toplotni optimum pred 9.000–6.000 leti, s čimer se je naše podnebje približalo najtoplejšim temperaturam zraka zadnjega medledenega obdobja. Posledično se umikajo ledeniki, svetovna gladina morja pa trenutno narašča za 3,2 mm/leto ter tako dosega višje ravni kot kadar koli od konca zadnjega medledenega obdobja (Summerhayes & Zalasiewicz, 2018).

Kakšna bo torej naša prihodnost z vidika povprečne letne temperature zraka in količine/višine padavin? V okviru projekta CMIP6 (Eyring idr., 2016) je bilo razvitih pet podnebnih scenarijev za 21. stoletje (SSP1 [trajnostnost - nizki izzivi za ublažitev in prilagoditev], SSP2 [srednja pot – srednji izzivi za ublažitev in prilagoditev], SSP3 [regionalno rivalstvo – visoki izzivi za ublažitev in prilagoditev], SSP4 [neenakost – nizki izzivi za ublažitev, visoki izzivi za prilagoditev] ter SSP5 [na fosilna goriva vezan razvoj - visoki izzivi za ublažitev, nizki izzivi za prilagoditev]). Da bi ugotovili in primerjali bodočo jakost in smer podnebnih sprememb s preteklimi, smo v analizi obravnavali, ta trenutek realistični, sicer pa najbolj pesimistični scenarij SSP5-8.5. Le-ta predvideva povečanje neto sevanja za 8,5 W/m² do leta 2100, kar lahko povzroči globalno segrevanje za 3,3–5,7 °C (Hausfather, 2018). Za napovedovanje podnebnih trendov je ključno razumevanje pretekle podnebne dinamike, še posebej v luči zagotavljanja podnebno odporne družbe in zelenega prehoda (Shokry idr., 2022; Van Daalen idr., 2022).

2 Metodologija

2.1 Območje raziskave

V prispevku obravnavamo območje evropskega prostora, pri čemer smo v okolju geografskih informacijskih sistemom pripravili masko v obliki kvadrata, ki posledično zaobjema še okolico (Slika 1). Pri analizi podatkov se osredotočamo na interpretacijo rezultatov po državah na območju raziskave.



Slika 1: Območje raziskave.

Vir: HCMGIS, 2024.

2.2 Podatkovne baze

Da bi ocenili intenzivnost in smer podnebnih sprememb (ob upoštevanju povprečne letne temperature zraka in količine/višine padavin) v evropskem prostoru od pliocena do antropocena, smo uporabili prosto dostopno bazo podnebnih kazalcev portalov Paleoclim (Brown idr., 2018) ter CHELSA V2.1 (Brun idr., 2022; Karger idr., 2017). Obravnavali smo dve bioklimatski spremenljivki, bio1 (povprečna letna temperatura zraka [v °C*10]) ter bio12 (povprečna letna količina/višina padavin [v mm]) v prostorski ločljivosti 2,5 arc-minut (velikost slikovne enote ~5 km). V luči obeh kazalcev (bio1 in bio12) smo analizirali spremembe v vseh dostopnih časovnih oknih (krono-sekvencah) za preteklost (n=11), sedanost (1979-2013) ter prihodnost (časovno okno 2071-2100, scenarij SSP5-8.5, globalna podnebna modela MPI-ESM1-2-HR [Max Planck Institute for Meteorology, Nemčija] in IPSL-CM6A-LR [Institute Pierre Simon Laplace, Francija]) (Preglednica 1). Po prenosu podatkov smo le-te v okolju geografskih informacijskih sistemov prostorsko poenotili (koordinatni sistem WGS84) in omejili glede na mejo našega raziskovanega območja (Slika 1). V nadaljevanju smo za potrebe lažje interpretacije rezultatov primerjali jakost in smer podnebnih sprememb, v luči spremenljivk bio1 in bio12, po državah Evrope (in širše). Vektorski sloj političnih meja smo pridobili na statističnem portalu Evropske komisije (EuroStat, 2024).

Preglednica 1: Obravnavani časovni preseki in pripadajoči viri podatkov.

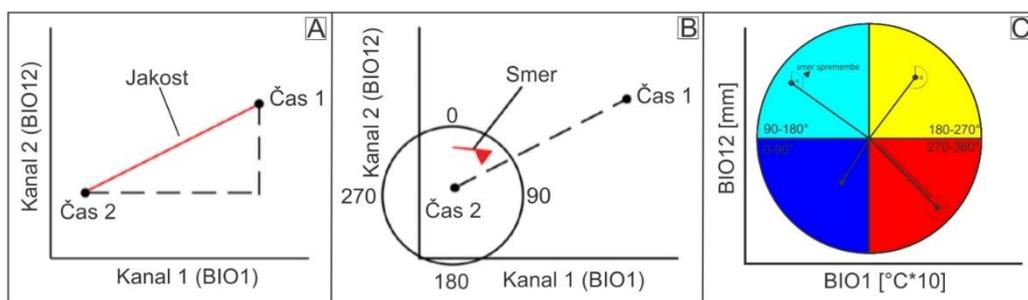
Vir: Avtorja.

ID	Časovno okno	Vir
13(2)	Prihodnost (2071-2100): SSP5-8.5, IPSL-CM6A-LR	Brun idr., 2022; Karger idr., 2017
13(1)	Prihodnost (2071-2100): SSP5-8.5, MPI-ESM1-2-HR	Brun idr., 2022; Karger idr., 2017
12	Sedanost (1979 - 2013): Antropocen, v1.2b**	Brun idr., 2022; Karger idr., 2017
11	Pleistocen: pozni-Holocen, Meghalayan (pred 4.200-300 leti), v1.0	Fordham idr., 2017 (Fordham idr., 2017)
10	Pleistocen: srednji-Holocen, Northgrippian (pred 8.326-4.200 leti), v1.0	Fordham idr., 2017
9	Pleistocen: zgodnji-Holocene, Greenlandian (11.700-8.326 leti), v1.0	Fordham idr., 2017
8	Pleistocen: stadij Younger Dryas (pred 12.900-11.700 leti), v1.0	Fordham idr., 2017
7	Pleistocen: stadij Bölling-Allerød (pred 14.700-12.900 leti), v1.0	Fordham idr., 2017

6	<i>Pleistocen: stadij Heinrich 1</i> (pred 17.000-14.700 leti), v1.0	Fordham idr., 2017
5	<i>Pleistocen: zadnji glacialni maksimum</i> (pred 21.000 leti), v1.2b**, <i>NCAR CCSM4</i>	Brun idr., 2022; Karger idr., 2017
4	<i>Pleistocen: zadnji interglacial</i> (pred 130.000 leti), v1.0	Otto-Bliesner idr., 2006 (Otto-Bliesner idr., 2006)
3	<i>Pleistocen: stadij MIS19</i> (pred 787.000 leti), v1.0*	Brown idr., 2018 (Brown idr., 2018)
2	<i>Pliocen: toplo obdobje srednjega-Pliocena</i> (pred 3,205 mio let), v1.0*	Hill, 2015 (Hill, 2015)
1	<i>Pliocen: stadij M2</i> (pred 3,3 mio let), v1.0*	Dolan idr., 2015 (Dolan idr., 2015)

2.3 Analiza podatkov

Sledila je predobdelava pridobljenih podatkov. Za potrebe vektorske analize sprememb (ang. *Change Vector Analysis; CVA*) v programskem okolju TerrSet2020 (Clark Labs, 2022) smo vse sloje (2 spremenljivki [bio1, bio12] x 14 časovnih oken) preoblikovali v ustrezen zapis (.rst) s pomočjo vmesnika ASCII. Izpeljali smo CVA po kronoloških parih/sekvencah (ID 1,2; ID 2,3; ID 3,4 ...) pri čemer smo za prvi kanal upoštevali spremenljivko bio1 (povprečna letna temperatura zraka [v °C*10]), za drugi kanal pa spremenljivko bio12 (povprečna letna količina padavin [v mm]). Produkta CVA ([1] jakost ter [2] smer sprememb; Slika 2) smo v nadaljevanju s pomočjo orodij zonalne statistike povprečili glede na vektor držav raziskovanega območja.



Slika 2: Shematski prikaz produktov analize CVA; jakost sprememb (A), smer sprememb (B in C).

Vir: Povzeto po Eastman, 2016.

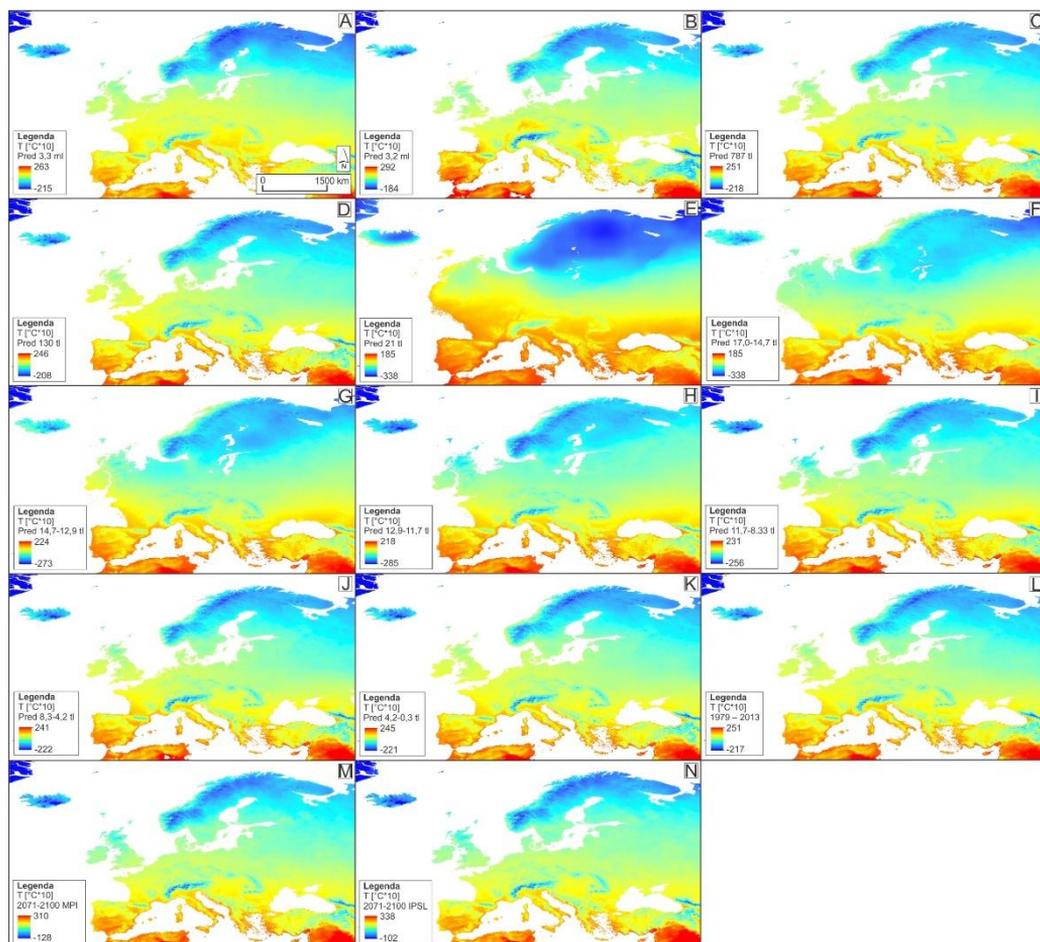
V nadaljevanju smo iskali podobnosti v jakosti in smeri podnebnih sprememb po dobljenih krono-sekvencah (n=13) glede na kazalca bio1 in bio12 med političnimi enotami (državami). Za vizualizacijo smo uporabili prostor NMDS (ang. *Non-metric Multi-Dimensional Scaling*), ki smo ga oblikovali s pomočjo funkcije *vegdist* in matrike Evklidskih razdalj s paketom *vegan* (Oksanen idr., 2008) v odprtokodnem programskem okolju R (R Development Core Team, 2023). Države smo v nadaljevanju, glede na podobnost kazalcev jakost in smer podnebnih sprememb kategorizirali s pomočjo multivariatne analize razvrščanja podatkov z voditelji (ang. *Kmeans clustering*) (število brstov = 10; število ponovitev = 20; število skupin/kategorij = 3). Razlike med skupinami držav po obeh kazalcih jakost ter smer sprememb (glede na spremenljivki bio1 in bio12) smo v nadaljevanju testirali s permutacijsko analizo variance (PERMANOVA; 999 ponovitev) v programskem okolju R (R Development Core Team, 2023). Pri kazalcu jakost sprememb, glede na vrednosti spremenljivk bio1 in bio12, smo zaradi velikega variacijskega razmika, uporabili Hellingerjevo transformacijo podatkov. Uporabili smo funkcijo *decosdtand* v paketu

vegan (Oksanen idr., 2008). Na ta način smo zmanjšali težo večjih vrednosti dane spremenljivke in hkrati ohranili razmerje evklidskih razdalj med obravnavanimi državami v NMDS prostoru (Legendre & Gallagher, 2001). Vzporedno smo izvedli še kontrolna preizkusa *betadisper* in *permutest*, ki sta preverila variabilnost v razpršenosti držav po skupinah v prostoru NMDS glede na spremenljivki jakost ali smer sprememb. Analizo smo zaključili z implementacijo algoritma *simper* (ang. *similarity percentages*) za kazalca jakost in smer sprememb ločeno (glede na kazalca bio1 in bio12), s čimer smo pridobili informacije o tem, v katerem časovnem oknu (krono-sekvenci) so razlike v jakosti in smeri podnebnih sprememb med skupinami držav v evropskem prostoru značilno različne ($p < \alpha$; $\alpha = 0,05$).

3 Rezultati

3.1 Pretekle in bodoče temperaturne razmere v evropskem prostoru

Pretekli (A do K), recentni (L) in prihodnji (M, N) prostorski vzorec spremenljivke bio1 (povprečna letna temperatura zraka [$v \text{ } ^\circ\text{C} \cdot 10$]) prikazuje mozaik na Sliki 3. Zaznavne so spremembe vrednosti spremenljivke bio1 med posameznimi časovnimi preseki, bodisi po geografski širini in dolžini, bodisi po nadmorski višini. Izpostavimo lahko tudi spreminjanje obale oziroma meje kopno-morje ob menjavanju hladnejših (E do I) in toplejših (A do D) obdobj. Najnižje vrednosti povprečne letne temperature zraka ($^\circ\text{C} \cdot 10$) dosega časovni presek E, ki prikazuje ocenjeno stanje ob nastopu zadnje maksimalne poledenitve (pred 21.000 leti). V primerjavi z recentnim stanjem (1979-2013; L), so bile po obravnavani oceni povprečne letne maksimalne temperature zraka takrat v širšem evropskem prostoru nižje za 6,6 $^\circ\text{C}$, povprečne minimalne temperature zraka pa nižje za 12,1 $^\circ\text{C}$. Najbolj podoben prostorski vzorec spremenljivke bio1, v primerjavi s sedanostjo, prikazuje njena ocena za obdobje *MIS19* (pred 787.000 leti) (C). Ob upoštevanju scenarija izpustov toplogrednih plinov SSP5-8.5 in napovedi globalnih podnebnih modelov MPI-ESM1-2-HR ter IPSL-CM6A-LR, ob koncu 21. stoletja (M, N) lahko pričakujemo primerljiv prostorski vzorec povprečne temperature zraka z obdobjem pred približno 3,2 milijona let (toplo obdobje srednjega pliocena).

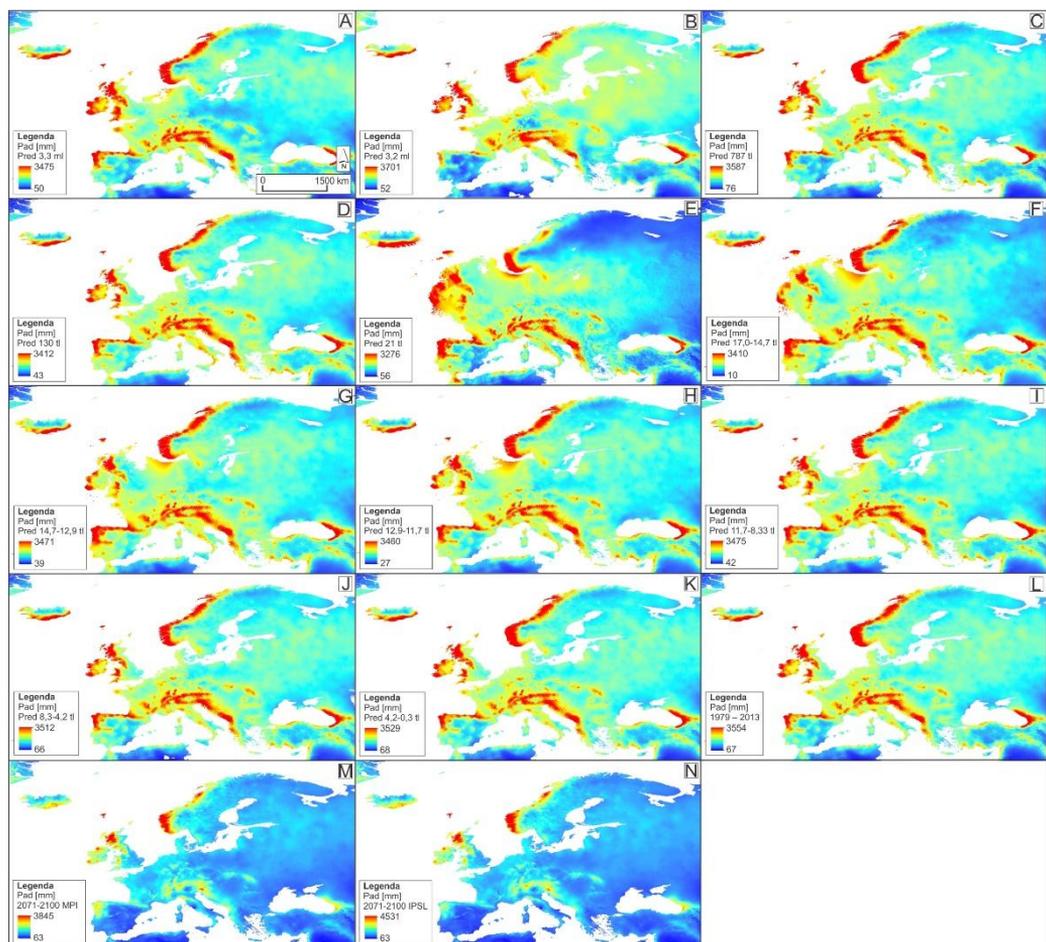


Slika 3: Spremenljivka bio1 (povprečna letna temperatura zraka [$v \text{ } ^\circ\text{C}\cdot 10$]) po obravnavanih krono-sekvencah (A do N).

Vir: Avtorja.

3.2 Pretekle in bodoče padavinske razmere v evropskem prostoru

Ocene razporeditve in količine/višine padavin v obravnavanih časovnih presekih nakazujejo bolj homogeni vzorec (Slika 4). Lega ob Atlantiku, reliefna energija ter celinskost sooblikujejo prostorski padavinski vzorec, ki od pliocena do danes, z nekaj izjemami (E), ostaja dokaj podoben. Tudi količina padavin po obravnavanih ocenah ni imela velikega variacijskega razmika. Tako največjo količino padavin (do 3,701 mm) v preteklosti kaže ocena za toplo obdobje srednjega pliocena (pred približno 3,2 milijona let), najnižjo pa obdobje zadnje največje poledenitve (pred 21.000 leti) (3276 mm). Napovedi (do konca 21. stoletja) ne predvidevajo večjih sprememb prostorskega padavinskega vzorca, znatno pa bi se, ob upoštevanju pesimističnega scenarija SSP5-8.5, lahko povečala njihova količina (ponekod tudi do 4500 mm) in variabilnost (večji variacijski razmik).



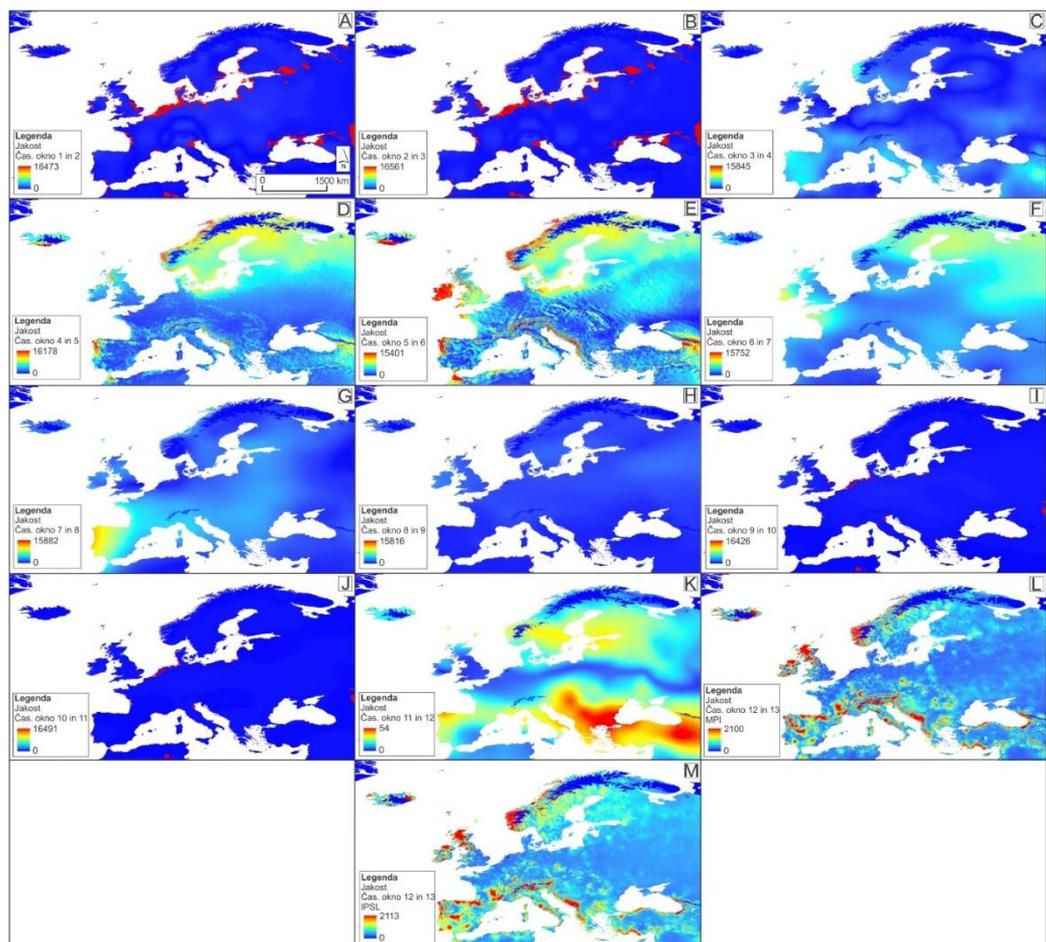
Slika 4: Spremenljivka bio12 (povprečna letna količina/višina padavin [v mm]) po obravnavanih krono-sekvencah (A do N).
Vir: Avtorja.

3.3 Jakost podnebnih sprememb v evropskem prostoru od pliocena do antropocena

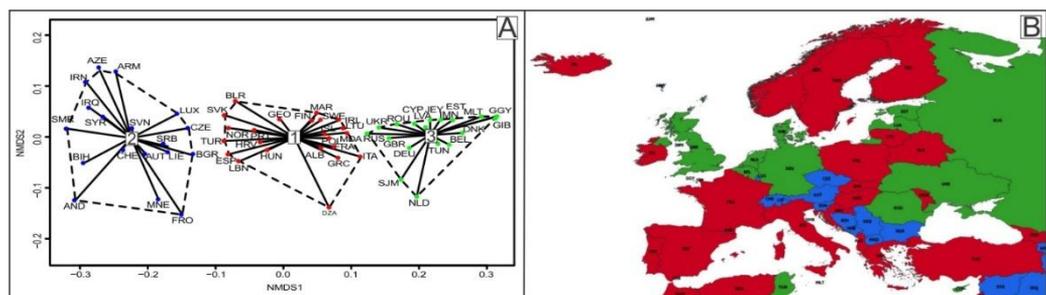
Časovno sosledje jakosti sprememb ob upoštevanju spremenljivk bio1 (povprečna letna temperatura zraka [v °C*10]) in bio12 (povprečna letna količina padavin [v mm]) prikazuje mozaik (A do M) na Sliki 5. Zaznavna je velika variabilnost vektorja jakosti v posameznih časovnih presekih. Iz pliocena v pleistocen maksimalne vrednosti dosegajo predvsem obalni in nižinski predeli obravnavanega območja. Po zadnjem obdobju maksimalne poledenitve (E) visoke vrednosti jakosti sprememb dosegajo predeli umikanja ledenega pokrova ter priobalni pas. Iz zgodnjega v srednji holocen (I) ter iz srednjega v pozni holocen (J) je prostorski vzorec jakosti sprememb iz zornega kota spremenljivk bio1 in bio12 podoben tistemu iz pliocena v pleistocen (B). Vektor jakosti v časovnem preseku pozni holocen-recentno stanje (K) izgubi na dolžini (vrednosti), ima pa značilno drugačen prostorski odtis. Večja ocenjena jakost sprememb je zaznavna v dveh pasovih po geografski širini (med 55 in 60° s.g.š. ter

med 35 in 45° s.g.š.), oziroma ob Baltskem in Sredozemskem morju. Kot v vseh obravnavanih krono-sekvencah so najbolj stabilna območja Skandinavsko gorovje in visoki predeli Alp ter Islandije. Prognoze za prihodnost (L, M) ocenjujejo postopno povečevanje jakosti sprememb praktično po celotnem evropskem prostoru (z izjemo visokih Alp in Skandinavskega gorovja). Predvsem v sredozemskem pasu lahko pričakujemo največjo jakost sprememb bodisi povprečne letne temperature zraka bodisi zmanjšanje količine/višine padavin.

Na jakost podnebnih sprememb v luči spremenljivk bio1 in bio12 smo pogledali še iz politično-geografskega konteksta. Slika 6 prikazuje skupine političnih enot (držav) na območju raziskave, ki so si po jakosti sprememb povprečne temperature zraka in povprečne letne količine/višine padavin bodisi podobne (znotraj skupine) bodisi različne (med skupinami) (Slika 6). Z analizo razvrščanja z voditelji smo oblikovali tri značilno različne skupine (PERMANOVA p-vrednost $< \alpha$; $\alpha = 0,05$) držav glede na jakost sprememb v obravnavanih krono-sekvencah. Neznačilna preizkusa *betadisper* ($p = 0,321$; $\alpha = 0,05$) in *permutest* ($p = 0,337$; $\alpha = 0,05$) dokazujeta, da je razpršenost držav glede na centroid skupine podobna, kar opravičuje uporabo analize *simper*, ki v našem primeru ugotavlja doprinos posamezne krono-sekvence k zaznanim razlikam v jakosti sprememb v luči spremenljivk bio1 in bio12 med skupinami držav v obravnavanem prostoru. Skupino 1 (rdeča barva) tvori 23 političnih enot (v Evropi Albanija, Andora, Belorusija, Finska, Francija, Gibraltar, Grčija, Hrvaška, Irska, Islandija, Italija, Litva, Madžarska, Malta, Moldavija, Norveška, Poljska, Portugalska, San Marino, Slovaška, Švedska, Španija, Turčija), skupino 2 (modra barva) tvori 19 enot (v Evropi Avstrija, Bosna in Hercegovina, Bulgarija, Češka, Črna gora, Lihtenštajn, Luksemburg, Severna Makedonija, Slovenija, Srbija, Švica), skupino 3 (zelena barva) pa 18 enot (v Evropi Belgija, Ciper, Danska, Estonija, Latvija, Nemčija, Nizozemska, Romunija, Rusija, Ukrajina, Združeno kraljestvo).



Slika 5: Jakost sprememb temperaturnih (bio1) in padavinskih (bio12) razmer po obravnavanih krono-sekvencah (A do M) (Preglednica 1).
Vir: Avtorja.



Slika 6: Prikaz skupin držav s podobno (znotraj skupine) ali različno (med skupinami) dinamiko jakosti sprememb temperaturnih in padavinskih razmer po obravnavanih krono-sekvencah v prostoru NMDS (A) in na zemljevidu (B).
Vir: Avtorja.

Iz Preglednice 2 lahko razberemo v katerih krono-sekvencah se skupine političnih entot (držav) značilno razlikujejo po jakosti sprememb v luči spremenljivk bio1 in bio12. Skupini 1 in 2 se po jakosti sprememb najbolj razlikujeta v sekvencah pliocen M2 – toplo obdobje srednjega pliocena [1_2] (z večjo jakostjo v državah skupine 1), sedanost – prihodnost (MPI-ESM1-2-HR) [12_13(1)], sedanost – prihodnost (IPSL-CM6A-LR) [12_13(2)]. V obeh krono-sekvencah za prihodnost se pričakuje večja jakost sprememb z vidika spremenljivk bio1 in bio12 v državah iz skupine 2. Sledijo še sekvence pleistocen *MIS19* – zadnji interglacial [3_4], pleistocen *Bølling-Allerød* stadij – pleistocenski stadij *Younger Dryas* [7_8] ter pozni holocen – sedanost [11_12]. Pri slednjih je ocenjena jakost sprememb značilno večja v državah iz skupine 2. V preostalih krono-sekvencah je bila jakost sprememb med skupinama držav 1 in 2, v koordinatnem sistemu spremenljivk bio1 in bio12, podobna.

Preglednica 2: Številski povzetek primerjava parov skupin držav po obravnavanih krono-sekvencah z vidika jakosti sprememb vezanih na temperaturne in padavinske razmere.

Vir: Avtorja.

Kontrast: 2_1								
ID	rang	povprečje	sd	razmerje	ava	avb	p-vrednost	
1_2	1	0.074	0.030	2.483	0.137	0.284	0.025	*
12_13(1)	3	0.033	0.024	1.376	0.118	0.052	0.002	**
12_13(2)	4	0.033	0.019	1.747	0.132	0.067	0.010	**
3_4	7	0.021	0.017	1.244	0.063	0.028	0.002	**
7_8	8	0.013	0.009	1.397	0.042	0.026	0.063	.
11_12	12	0.008	0.006	1.481	0.024	0.010	0.002	**
Kontrast: 2_3								
2_3	1	0.140	0.028	5.055	0.126	0.406	0.001	***
1_2	2	0.135	0.029	4.576	0.137	0.407	0.001	***
12_13(2)	3	0.056	0.018	3.040	0.132	0.020	0.001	***
4_5	4	0.054	0.025	2.159	0.133	0.026	0.001	***
12_13(1)	5	0.051	0.024	2.140	0.118	0.016	0.001	***
5_6	6	0.041	0.021	1.967	0.104	0.021	0.001	***
3_4	7	0.028	0.019	1.467	0.063	0.008	0.001	***
7_8	8	0.018	0.011	1.666	0.042	0.007	0.001	***
6_7	9	0.017	0.009	1.907	0.046	0.013	0.001	***
11_12	12	0.011	0.006	1.771	0.024	0.003	0.001	***
8_9	13	0.008	0.005	1.639	0.021	0.008	0.001	***
Kontrast: 1_3								
10_11	7	0.017	0.016	1.057	0.033	0.032	0.032	*

ava = povprečna vrednost vhodne spremenljivke (jakost sprememb) prvega kontrasta, avb = povprečna vrednost vhodne spremenljivke (jakost sprememb) drugega kontrasta

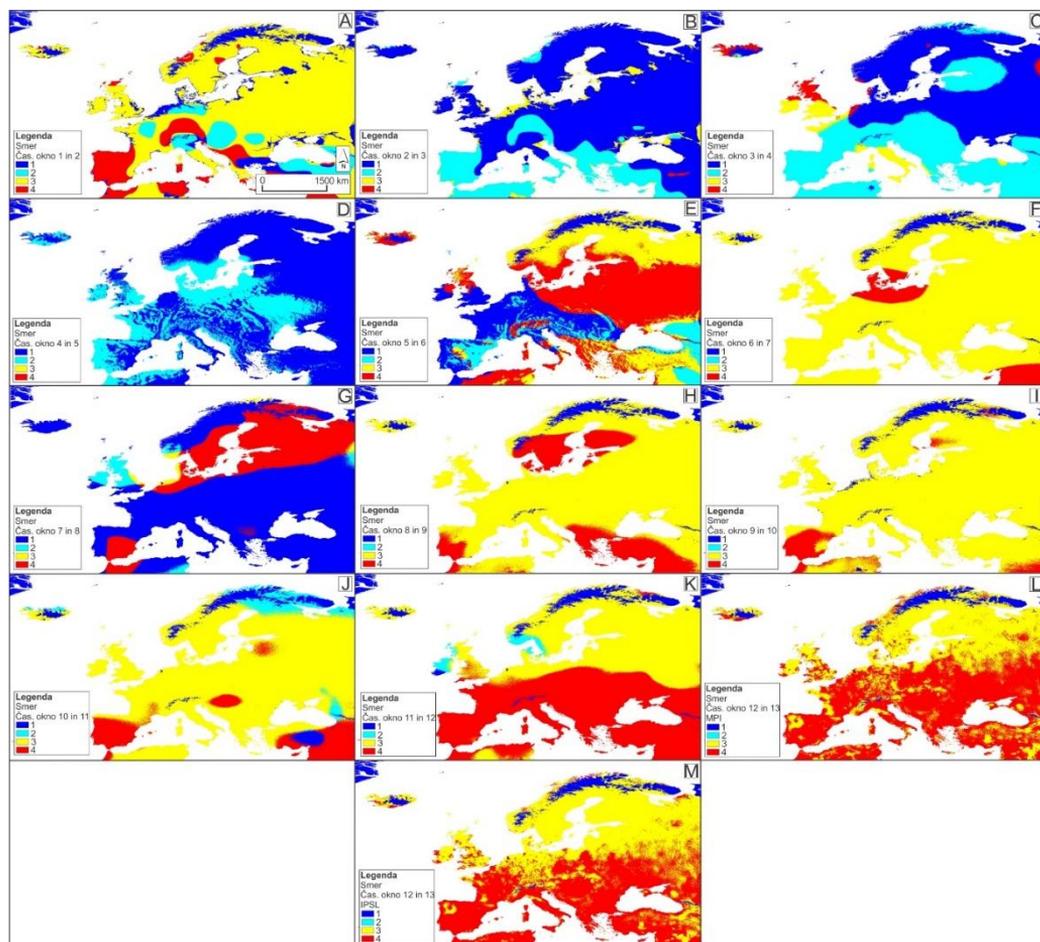
Če primerjamo skupini držav 3 in 1, ugotovimo, da so bile značilne razlike med njima v jakosti sprememb spremenljivk bio1 in bio12 le v krono-sekvenci srednji holocen – pozni holocen [10_11], z nekaj višjo jakostjo v državah iz skupine 1. Primerjava para skupin 2 in 3 pa kaže značilne razlike v jakosti sprememb praktično v vsaki obravnavani krono-sekvenci. Na prvem mestu po doprinosu k spremembam v jakosti je toplo obdobje srednjega pliocena (približno 3,2 milijona let) – pleistocen *MIS19* (787.000 let) [2_3] z značilno večjo jakostjo v državah iz skupine 3 (zelena barva). Na drugem mestu doprinosu k razlikam med skupnima je krono-sekvencia pliocen M2 (3,3 milijona let) - toplo obdobje srednjega pliocena (približno 3,2 milijona let) [1_2] s prav tako večjo jakostjo v državah iz skupne 3 (zelena barva). Temu po razlikah v jakosti sprememb že sledi sekvenca, ki napoveduje stanje za konec 21. stoletja [12_13(2)] pri čemer se pričakuje večja jakost sprememb v državah iz skupine 2

(modra barva). Podobno velja tudi za sekvenco zadnji interglacial (pred 130.000 leti) – zadnji glacialni maksimum (pred 21.000 leti) [4_5].

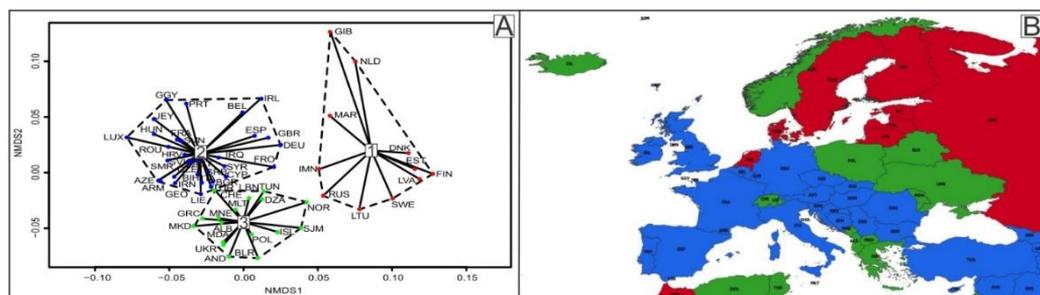
3.4 Smer podnebnih sprememb v evropskem prostoru od pliocena do antropocena

Na Sliki 7 je prikazan kategorizirani drugi produkt analize CVA, ki prikazuje smer sprememb v luči spremenljivk bio1 (kanal 1 = os x) in bio12 (kanal 2 = os y). Za lažjo interpretacijo smo oblikovali štiri razrede, ki prikazujejo naslednje smeri sprememb: 1 = 0-90°, zmanjševanje vrednosti bio1 (povprečna letna temperatura zraka [v °C*10]) in zmanjševanje vrednosti bio12 (povprečna letna količina/višina padavin [v mm]); 2 = 90-180°, zmanjševanje vrednosti bio1 in povečevanje vrednosti bio12; 3 = 180-270°, povečevanje vrednosti bio1 in povečevanje vrednosti bio12; ter 4 = 270-360°, povečevanje vrednosti bio1 in zmanjševanje vrednosti bio12. Prva krono-sekvenca (A, [1_2]) prehod v toplo obdobje srednjega pliocena (približno 3,2 milijona let) po večini evropskega prostora nakazuje povečanje vrednosti obeh obravnavanih spremenljivk (bio1 in bio12), z izjemo Pirenejskega polotoka, predelov srednje in jugovzhodne Evrope, ki so bili takrat deležni zmanjševanja količine/višine padavin. Obraten proces (zmanjševanje povprečne letne temperature zraka in povečanje povprečne letne količine padavin) pa je zaznaven na predelih Alp, Panonskega bazena ter vzdolž Severnega in Črnega morja. Območja zmanjševanja vrednosti obeh spremenljivk so vezana na priobalni pas in Skandinavsko gorovje.

Že v naslednji krono-sekvenci (B; [2_3]) so smeri sprememb na obravnavanem območju drugačne, a podobne z naslednjima dvema (C [3_4] in D [4_5]). Po površini prevladujeta kategoriji 1 in 2, ki predstavljata bodisi ohladitev in zmanjšanje količine/višine padavin bodisi ohladitev in povečanje količine/višine padavin. Sledi po smeri sprememb bolj pestro obdobje 5_6 (E; zadnja maksimalna poledenitev-pleistocen stadij Heinrich). Severni in vzhodni predeli evropskega prostora so bili deležni bodisi otoplitve in povečanja količine/višine padavin bodisi otoplitve in zmanjšanja količine/višine padavin. Enak vzorec je zaznaven na predelih britanskega otočja, Alp ter Balkanskega polotoka. Po drugi strani so nekateri predeli Evrope istočasno postajali hladnejši in bolj sušni (zahodni in južni del Pirenejskega polotoka, deli srednje in vzhodne Evrope in severna Italija...) oziroma hladnejši in bolj vlažni (vzhodni del Pirenejskega polotoka, nižinski predeli srednje in južne Evrope). Po smeri sprememb so si podobne naseljanje krono-sekvence: 6_7 (E), 8_9 (H), 9_10 (I) in 10_11 (J). V vseh po površini prevladujeta kategoriji 3 (otoplitev in povečanje količine/višine padavin) in 4 (otoplitev in zmanjšanje količine/višine padavin) z izjemo goratih predelov kjer sta se povprečna temperatura zraka in povprečna količina/višina padavin zmanjševali. V krono-sekvenci 11_12 (K; pozni holocen – recentno stanje) je prepoznavna zonacija zaznanih smeri sprememb vzdolž geografske širine. Južni in osrednji predeli raziskanega območja so bili deležni segrevanja ozračja in zmanjševanja količine/višine padavin, med tem ko so severni predeli Evrope po večini (z izjemo Skandinavskega gorovja) bili deležni povečanja tako temperature zraka kot količine/višine padavin. Predvidena smer sprememb spremenljivk bio1 in bio12 do konca 21. stoletja (po obeh globalnih podnebnih modelih [MPI-ESM1-2-HR ter IPSL-CM6A-LR]), prikazano na Sliki 7 L in M, je po vzorcu primerjavi z krono-sekvenco 11_12 (pozni holocen – recentno stanje). Po površini v obeh napovedih prevladujeta smeri 3 (180-270°; povečanje vrednosti tako bio1 kot bio12) in 4 (270-360°; povečanje vrednosti bio1 in zmanjšanje vrednosti bio12). Zaznavna je sprememba smeri z višanjem geografske širine ali nadmorske višine, saj na dobljeni prostorski vzorec spremembe vplivajo številni naravno- in družbeno-geografski dejavniki.



Slika 7: Smer sprememb temperaturnih (bio1) in padavinskih (bio12) razmer po obravnavanih krono-sekvencah (A do M).
Vir: Avtorja.



Slika 8: Prikaz skupin držav z bodisi podobno (znotraj skupine) ali različno (med skupinami) dinamiko smeri sprememb temperaturnih in padavinskih razmer po obravnavanih krono-sekvencah v prostoru NMDS (A) in na zemljevidu (B).
Vir: Avtorja.

Tako kot pri jakosti smo tudi pri smeri sprememb v luči spremenljivk bio1 in bio12 iskali podobnosti in razlike med politično-geografskimi enotami (državami). Na enak način (s pomočjo analize razvrščanja z voditelji) smo oblikovali, po smeri sprememb, značilno različne skupine držav (PERMANOVA p-vrednost $< \alpha$; $\alpha = 0,05$), ki so prikazane v prostoru NMDS in na zemljevidu na Sliki 8. Skupino 1 (rdeča barva) sestavlja 11 držav (v Evropi Danska, Estonija, Finska, Latvija, Litva, Nizozemska, Rusija, Švedska), skupino 2 (modra barva) sestavlja 32 držav (v Evropi Andora, Avstrija, Belgija, Bosna in Hercegovina, Bulgarija, Ciper, Češka, Francija, Gibraltar, Hrvaška, Irska, Italija, Luksemburg, Madžarska, Malta, Nemčija, Portugalska, Romunija, San Marino, Slovaška, Slovenija, Srbija, Španija, Švica, Turčija, Združeno kraljestvo) in skupino 3 (zelena barva) 17 držav (v Evropi Albanija, Belorusija, Črna gora, Grčija, Islandija, Lihtenštajn, Moldavija, Norveška, Poljska, Severna Makedonija, Ukrajina). Neznačilnost kontrolnih statističnih preizkusov *betadisper* ($p = 0,2808$; $\alpha = 0,05$) in *permutest* ($p = 0,296$; $\alpha = 0,05$) je tudi tukaj opravičila uporabo algoritma *simper*, katerega povzetek je prikazan v Preglednici 3. Skupini držav 1 (rdeča barva) in 2 (modra barva) se po smeri sprememb spremenljivk bio1 in bio12 značilno razlikujeta v sedmih od trinajst obravnavanih krono-sekvencah. Največ k razlikam, po zaporedju, doprinesejo naslednje krono-sekvence: 7_8 (pleistocen stadij *Bølling-Allerød* [pred 14.700-12.900 leti] – pleistocen stadij *Younger Dryas* [pred 12.900-11.700 leti]), 5_6 (zadnji glacialni maksimum [pred 21.000 leti] – pleistocen stadij Heinrich [pred 17.000-14.700 leti]) in 11_12 (pozni holocen [pred 4.200-300 leti] – sedanost [1979-2013]). V krono-sekvenci 7_8 so imele države iz skupine 2 značilno večjo povprečno vrednost kota sprememb (193; povečanje vrednosti tako spremenljivke bio1 kot spremenljivke bio12) v primerjavi s skupino 1 (22; zmanjšanje vrednosti spremenljivk bio1 in bio12). Obratno velja za krono-sekvenco 5_6, pri čemer je ocenjena povprečna vrednost kota sprememb skupine 1 (rdeča barva) enaka 294 (povečanje vrednosti spremenljivke bio1 in zmanjšanje vrednosti spremenljivke bio12), skupine 2 (modra barva) pa 173 (povečanje vrednosti obeh spremenljivk). Identičen vzorec smeri sprememb je zaznaven za krono-sekvenco 11_12. Na četrtem mestu doprinosi k razlikam med državami iz skupin 1 in 2 je krono-sekvence 12_13(2), ki predstavlja oceno smeri sprememb do konca 21. stoletja v primerjavi z recentnim stanjem. Tudi v tem primeru se pričakuje na območju držav iz skupine 1 povečanje vrednosti spremenljivke bio1, hkrati pa zmanjšanje vrednosti spremenljivke bio12, medtem ko se na območju držav iz skupine 2 predvideva povečanje tako povprečne letne temperature zraka kot povprečne letne količine/višine padavin.

Preglednica 3: Številski povzetek primerjava parov skupin držav po obravnavanih krono-sekvencah z vidika smeri sprememb vezanih na temperaturne in padavinske razmere.

Vir: Avtorja.

Kontrast: 1_2								
ID	rang	povprečje	sd	razmerje	ava	avb	p-vrednost	
7_8	1	0.033	0.020	1.658	22.000	193.070	0.001	***
5_6	2	0.027	0.020	1.380	294.600	173.460	0.010	**
11_12	3	0.027	0.017	1.593	325.000	201.010	0.001	***
12_13(2)	4	0.019	0.015	1.268	305.000	224.020	0.001	***
3_4	5	0.018	0.014	1.323	137.700	110.070	0.008	**
12_13(1)	6	0.018	0.016	1.125	301.500	234.000	0.001	***
1_2	7	0.017	0.014	1.244	219.900	153.170	0.010	**
2_3	8	0.016	0.010	1.558	115.600	68.240	0.002	**

8_9	9	0.012	0.013	0.905	266.700	223.570	0.010	**
Kontrast: 1_3								
5_6	1	0.033	0.015	2.155	294.600	123.700	0.001	***
2_3	2	0.015	0.010	1.568	115.600	54.400	0.002	**
Kontrast: 3_2								
7_8	1	0.036	0.021	1.699	16.700	193.070	0.001	***
11_12	2	0.030	0.018	1.664	333.300	201.010	0.001	***
3_4	4	0.020	0.014	1.378	161.600	110.070	0.001	***
12_13(2)	5	0.017	0.016	1.105	288.000	224.020	0.001	***
12_13(1)	6	0.017	0.016	1.056	296.800	234.000	0.001	***
10_11	7	0.016	0.016	1.018	248.300	202.250	0.007	**
6_7	10	0.010	0.012	0.838	230.100	211.760	0.031	*

ava = povprečna vrednost vhodne spremenljivke (jakost sprememb) prvega kontrasta, avb = povprečna vrednost vhodne spremenljivke (jakost sprememb) drugega kontrasta

Če primerjamo skupini držav 1 (rdeča barva) in 3 (zelena barva), lahko na podlagi analize *simper* sklepamo, da k razlikam v smeri sprememb spremenljivk bio1 in bio12 značilno doprineseta predvsem dve krono-sekvenci (skupaj 36%); in sicer 5_6 (zadnji glacialni maksimum [pred 21.000 leti] – pleistocen stadij *Heinrich* [pred 17.000-14.700 leti]) ter 2_3 (toplo obdobje srednjega pliocena [pred 3,205 mio leti] – pleistocen *MIS19* [pred 787.000 leti]). V skupini 1 (rdeča barva), v krono-sekvenci 5_6, beležimo smer povečevanja vrednosti spremenljivke bio1 in zmanjševanje vrednosti spremenljivke bio12, medtem ko so bile države iz skupine 3 (zelena barva) takrat deležne ohlajanja (zmanjševanje vrednosti spremenljivke bio1) in povečevanja letne količine padavin (povečevanje vrednosti spremenljivke bio12). Območje držav iz skupine 1 se je v krono-sekvenci 2_3 prav tako ohlajalo in postajalo bolj vlažno, območje držav, ki tvori skupino 3, pa se je takrat ohlajalo in postajalo bolj sušno. Primerjava območij, ki jih tvorijo države iz skupin 2 (modra barva) in 3 (zelena barva), v sedmih od trinajstih krono-sekvencah nakazuje značilne razlike smeri sprememb spremenljivk bio1 in bio12. Prva tri mesta po doprinosu k razlikam med skupinama držav 2 in 3 zasedajo krono-sekvence 7_8 (pleistocen stadij *Bølling-Allerød* [pred 14.700-12.900 leti] – pleistocen stadij *Younger Dryas* [pred 12.900-11.700 leti]), 11_12 (pozni holocen [pred 4.200-300 leti] – sedanost [1979-2013]) ter 3_4 (pleistocen *MIS19* [pred 787.000 leti] – zadnji interglacial [pred 130.000 leti]). V krono-sekvenci 7_8 je na območju držav skupine 2 ocenjena otoplitev in povečanje letne količine/višine padavin (povprečen kot sprememb enak 193°), prav nasprotno pa velja za območje, ki ga tvorijo države skupine 3 (povprečen kot sprememb enak 16,7°; zmanjševanje vrednosti spremenljivk bio1 in bio12). V krono-sekvenci 11_12 so države iz obeh primerjanih skupin (2 in 3) bile deležne otoplitve. Razlike se pojavijo pri spremenljivki bio12, kjer je bilo območje držav skupine 2 deležno povečanja, območje držav skupine 3 pa zmanjšanja povprečne letne količine/višine padavin. V krono-sekvenci 3_4 so procesi spreminjanja povprečne letne temperature zraka in količine/višine padavin na območjih držav skupin 2 in 3 podobni. Območje se je ohlajalo in postajalo bolj vlažno. Po doprinosu k razlikam med območji držav skupine 2 in 3 se na 5. in 6. mestu nahajata napovedi obeh obravnavanih globalnih podnebnih modelov (MPI-ESM1-2-HR ter IPSL-CM6A-LR) za konec 21. stoletja. Oba, območju skupne 3. napovedujeta značilno otoplitev in zmanjšanje količine/višine padavin, medtem ko v območju držav skupine 2 lahko pričakujemo otoplitev z povečanjem vlažnostnih razmer.

4 Sklep

Zgodovinski razvoj paleo-podnebnja je pomembno gonilo recentnih vzorcev biotske raznovrstnosti (biodiverzitete) (Fordham idr., 2017). Številne študije ekološkega modeliranja so potrdile visoko informativno moč paleo-podnebnih kazalcev oziroma podatkov. Paleo-podnebnne rekonstrukcije se običajno kombinirajo z okoljskimi in genetskimi podatki, da se ugotovijo učinki preteklih podnebnih sprememb na bogastvo vrst (Araújo idr., 2008), endemizem (Sandel idr., 2011) ter filogenetsko (Rosauer & Jetz, 2015) in funkcionalno raznolikost (Ordonez & Svenning, 2015). Uporabljajo se tudi za raziskovanje in preizkušanje hipotez o dinamiki priseljevanja in izumiranja vrst (Saltré idr., 2016) ter za razvoj strategij blaženja izgube biotske raznovrstnosti zaradi antropogeno pospešenih podnebnih sprememb (Fordham idr., 2014, 2016). Posledično obstaja velika težnja po povečanju časovne in prostorske ločljivosti paleo-podnebnih podatkov (in kazalcev), primernih za odkrivanje ekoloških in evolucijskih odzivov na pretekle podnebnne spremembe. Do nedavnega je omejena razpoložljivost dostopnih podnebnih podatkov za časovna obdobja, ki niso srednji holocen (pred 6.000 leti), zadnji glacialni maksimum (LGM, pred 21.000 leti) ali zadnji interglacial (pred 130.000 leti), predstavljala veliko oviro (Brown & Knowles, 2012; Knowles idr., 2007). Korak naprej na tem področju predstavljajo podatki ekipe PaleoClim (Brown idr., 2018), ki temeljijo na kompleksnih matematičnih globalnih podnebnih modelih (HadCM3 in GCM), ki v desetih preteklih časovnih presekih (krono-sekvencah), simulirajo Zemljino atmosferko-oceansko dinamiko ob upoštevanju lokacije in oblike kopenskih mas, koncentracije plinov CO₂/N₂O/CH₄ ter orbitalne parametre (PaleoClim, 2024). Če k temu dodamo prosto dostopne (istovrstne) podnebnne podatke (kazalce) za recentno obdobje (1979-2013) in prihodnost (CMIP6 protokol) iz baze CHELSA (Brun idr., 2022; Karger idr., 2017), lahko ugotavljamo in ocenjujemo prostorsko podobnost/različnost preteklih (naravnih) in bodočih (naravnih + antropogenih) podnebnih sprememb.

Tako v prispevku ugotavljamo, da so na obravnavanem območju, v luči spremenljivk povprečna letna temperatura zraka (v °C*10) [bio1] in povprečna letna količina/višina padavin (v mm) [bio12], še najbolj stabilna območja gorati predeli. Scherrer in Körner (2009) navajata, da so organizmi v gorskem pasu na splošno v boljšem položaju kot tisti v nižinskem pasu, ko se okoljske razmere spremenijo, saj specifična topografija ponuja mozaik alternativnih mikrohabitatov na kratkih razdaljah. Zato ni presenetljivo, da so bile gore v preteklosti vedno zatočišče (refugij) za mnoge rastlinske in živalske vrste v spreminjajočem se podnebnju. Po jakosti sprememb z vidika spremenljivk bio1 in bio12, na območju raziskave, prednjačijo krono-sekvence 1_2 (pliocen stadij M2 [pred 3,3 milijona let] – toplo obdobje srednjega pliocena [pred 3,205 milijona let]), 2_3 (toplo obdobje srednje pliocena [pred 3,205 milijona let] – pliocen stadij *MIS19* [pred 787.000 leti]) in 9_10 (zgodnji holocen [pred 11.700-8.326 leti] – srednji holocen [pred 8.326-4.200 leti]). Ocene sprememb temperaturnih in padavinskih razmer za konec 21. stoletja, po pesimističnem scenariju SSP5-8.5, so po jakosti, v primerjavi z preteklimi obdobji, sicer v povprečju (po večini) nižje, vendar z značilnimi regionalnimi razlikami. Tako je predvideni prostorski vzorec jakosti sprememb temperaturnih in padavinskih razmer korono-sekvenc 12_13(1) in 12_13(2) na drugem, tretjem ali petem mestu po doprinosu k razlikam med območji, ki jih tvorijo države v skupini 1, 2 ali 3. Slednje dokazuje primerljivost bodočih podnebnih sprememb, v širšem evropskem prostoru, z jakostjo tistih iz obdobja pliocen (od 5,2 do 2,6 milijona let). Analiza in primerjava krono-sekvenc smeri sprememb temperaturnih in padavinskih razmer je potrdila podnebno dinamičnost evropskega prostora v zadnjih treh milijonih let, za katero so značilni ponavljajoči se

cikli ohlajanja in zmanjševanja oziroma povečevanja količine padavin v času ledenih dob ter segrevanja in podobno variabilne padavinske razmere v času medledenih obdobj. Pesimistične napovedi za konec 21. stoletja kažejo jasno smer otoplitve in povečanja sušnosti (predvsem v Sredozemlju) ali otoplitve in povečanja vlažnosti (količine/višine padavin) v višjih geografskih širinah evropskega prostora. Gre za prostorski trend, ki ga kažejo tudi krono-sekvence 8_9 (pleistocen stadij *Younger Dryas* [pred 12.900-11.700 leti] - zgodnji-Holocene [pred 11.700-8.326 leti]), 9_10 (zgodnji-Holocene [pred 11.700-8.326 leti] - srednji-Holocen [pred 8.326-4.200 leti]), 10_11 (srednji-Holocen [pred 8.326-4.200 leti] - pozni-Holocen [pred 4.200-300 leti]) in 11_12 (pozni-Holocen [pred 4.200-300 leti] – sedanjost (Antropocen) [1979-2013]).

Tudi z vidika smeri sprememb temperaturnih in padavinskih razmer so zaznavne značilne regionalne razlike po obravnavanih krono-sekvencah. Oblikujemo lahko tri skupine držav, ki so si po dinamiki smeri sprememb temperaturnih in padavinskih razmer značilno različne, hkrati pa znotraj skupine podobne. K razlikam med skupinami, z vidika smeri sprememb, najbolj doprinesejo krono-sekvence 5_6 (zadnji glacialni maksimum [pred 21.000 leti] – Pleistocen stadij Heinrich [pred 17.000-14.700 leti]), 7_8 (Pleistocen stadij *Bølling-Allerød* [pred 14.700-12.900 leti] – Pleistocen stadij *Younger Dryas* [pred 12.900-11.700 leti]) in 11_12 (pozni-Holocen [pred 4.200-300 leti] – sedanjost-Antropocen [1979-2013]). V bodoče se bo, po ocenah obravnavanih globalnih podnebnih modelov (MPI-ESM1-2-HR ter IPSL-CM6A-LR) evropski prostor predvsem segreval (z izjemo alpskega visokogorja in Skandinavskega gorovja). Ponekod bo postajal bolj sušen (območje držav skupine 3), drugod pa bolj vlažen (območje držav skupine 2).

Tovrstne primerjalne analize opozarjajo na naravno dinamiko podnebnega sistema našega planeta in hkrati lahko služijo kot umerjanje jakosti prognoz pripravljenih za konec 21. stoletja, na katerih temelji, oziroma bo temeljilo, trenutno in bodoče upravljanje evropskega prostora za blaženja in prilagajanja na antropogeno pospešene podnebne spremembe.

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Summary

The historical evolution of paleo-climate is an important driver of recent biodiversity patterns. Numerous ecological modelling studies have confirmed the high informative power of paleo-climate indicators or data. Paleo-climate reconstructions are commonly combined with environmental and genetic data to infer the effects of past climate change on species richness, endemism, phylogenetic and functional diversity. They are also used to research and test hypotheses about the dynamics of species migration and extinction, and to develop strategies to mitigate biodiversity loss owing to anthropogenically-accelerated climate change. Consequently, there is a strong drive to increase the temporal and spatial resolution of paleo-climate data (and indicators) suitable for detecting ecological and evolutionary responses to past climate change. Until recently, the limited availability of accessible climate data for time periods other than the Middle Holocene (6.000 years ago), the Last Glacial Maximum (LGM, 21.000 years ago), or the Last Interglacial (130.000 years ago) was a major obstacle. A step forward in this field are the data provided by the PaleoClim team, that are based on complex mathematical global climate models (HadCM3 and GCM). By adding freely available (identical) climate data (indicators) for the recent period (1979-2013) and the future (CMIP6 protocol) from the CHELSA database, we can determine and evaluate the spatial similarity/difference of past (natural) and future (natural + anthropogenic) climate changes.

Thus, based on our results, we conclude that in the study area, from the perspective of variables average annual air temperature (in °C*10) [bio1] and average annual precipitation (in mm) [bio12], the most stable areas were the mountainous regions. Scherrer and Körner (2009) stated that organisms in the mountains are generally better off than those in the lowland belt when environmental conditions change, as the specific topography offers a mosaic of alternative microhabitats over short distances. Therefore, it is not surprising that mountains have always been a refuge area for many plant and animal species in the changing climate. According to the change magnitude indicator, from the perspective of variables bio1 and bio12, in the research area, chrono-sequences 1_2 (Pliocene stage M2 [3.3 Mya] – mid Pliocene warm period [3.205 Mya]), 2_3 (mid Pliocene warm period [3.205 Mya] – Pliocene stage MIS19 [787 Kya]) and 9_10 (Early Holocene [11.7-8.3 Kya] – Middle Holocene [8.3-4.2 Kya]). Estimates of changes in temperature and precipitation conditions for the end of the 21st century, according to the pessimistic scenario SSP5-8.5, are lower in magnitude compared to past periods, on average (in most cases), but with significant regional differences. Thus, the predicted spatial pattern of climate change of the chrono-sequences 12_13(1) and 12_13(2) is in the second, third or fifth place in terms of contribution to the differences between the areas formed by the countries in group 1, 2 or 3. The latter illustrates the comparability of future climate changes, in the wider European area, with the intensity of those from the Pliocene period (5.2 to 2.6 million years ago). Analysis and comparison of chrono-sequences of climate change direction, from the temperature and precipitation conditions perspectives, confirmed high climate condition variability in the European area in the last three million years. Cooling and decreasing or increasing humidity during ice ages and warming of the atmosphere and decreasing or increasing of precipitation during interglacial periods. Pessimistic forecasts for the end of the 21st century show a clear direction of warming and drying (mainly in the Mediterranean) or warming and increasing humidity in the higher latitudes of the European area. It is a spatial trend that is also recognizable in chrono-sequences 8_9 (Pleistocene stage *Younger Dryas* [12.9-11.7 Kya] - early-Holocene [11.700-8.3 Kya]), 9_10 (early-Holocene [11.7-8,3

Kya] - middle-Holocene [8.3-4.2 Kya]), 10_11 (middle-Holocene [8.3-4.2 Kya] - late-Holocene [4.2-0.3 Kya]) and 11_12 (late-Holocene [4.2-0.3 Kya] – present (Anthropocene) [1979-2013]). Also from the climate change direction perspective, significant regional differences in the considered chrono-sequences emerged. We can form three groups of countries, which are characteristically different in terms of the dynamics of changes in temperature and precipitation conditions but are at the same time similar within the group. Chrono-sequences 5_6 (Last Glacial Maximum [21 Kya] – Pleistocene stage Heinrich [17 -14.7 Kya]), 7_8 (Pleistocene stage *Bølling-Allerød* [14.7-12.9 Kya] - Pleistocene stage *Younger Dryas* [12,900-11,700 years ago]) and 11_12 (late-Holocene [4.2-0.3 Kya] - present-Anthropocene [1979-2013]) contributed the most to the differences between the groups. In future estimates of the considered global climate models (MPI-ESM1-2-HR and IPSL-CM6A-LR), the European area will/could warm (with the exception of the Alpine highlands and the Scandinavian mountains). It will/could become drier in some places (group 3 countries) and wetter in others (group 2 countries).

Solid waste management and its problem in Asmara city of Eritrea

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Abstract

Urbanization, rising incomes, and lifestyle changes are major drivers of municipal solid waste generation, especially in developing countries. Asmara, Eritrea, faces significant waste management challenges, particularly due to a large, disorganized open dumping site at Betghiorghish. This site lacks a proper recycling strategy and threatens local biodiversity. A study was conducted to evaluate the types and amounts of waste generated in Asmara, using primary data collected from various economic groups through questionnaires. Study found a positive correlation between urbanization and waste generation. Moreover, different economic strata have different amount and nature of waste. There is report of increasing amount of non-biodegradable waste among the higher income people/region. An integrated sustainable planning is needed to manage the municipal waste.

Keywords

Solid waste, developing countries, Asmara city, dumping site, waste management, municipal garbage

Izvleček

Upravljanje s komunalnimi odpadki in z njimi povezane težave v Asmari, Eritreja

Urbanizacija, višji dohodki in spremembe življenjskega sloga so glavni dejavniki nastajanja trdnih komunalnih odpadkov v državah v razvoju. Asmara v Eritreji se sooča z velikimi izzivi glede ravnanja z odpadki, zlasti zaradi velikega, neurejenega odprtega odlagališča v Betghiorghishu, s čimer ogroža lokalno biotsko raznovrstnost. Študija, ki je obravnavala vrste in količine odpadkov na podlagi podatkov iz vprašalnikov, je pokazala pozitivno povezavo med urbanizacijo in nastajanjem odpadkov. Študija je pokazala, da obstaja pozitivna povezava med urbanizacijo in nastajanjem odpadkov. Poleg tega imajo različni gospodarski sloji različno količino in naravo odpadkov. Obstajajo poročila o vse večji količini biološko nerazgradljivih odpadkov med ljudmi/regijami z višjimi dohodki. Za ravnanje s komunalnimi odpadki je potrebno celostno trajnostno načrtovanje.

Ključne besede

Komunalni odpadki, države v razvoju, Asmara, odlagališče, upravljanje odpadkov, mestni odpadki



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1 Introduction

Solid waste management (SWM) is very acute and intricate problem in the cities of developing economies due rapid urbanization, increasing purchasing power, and changing life habits of the people (Gour and Singh 2023; Minghua et al., 2009). The solid waste management became more challenging in recent years due to tremendous increase in the share of the inorganic constituents in the wastes (Khajuria et al., 2011; Bhoyar et al., 2014). Developing states have meagre budget for waste management and the major portion of its budget goes to collection and transportation rather than their treatment and sustainable disposal (Mansoor et al., 2005; Burntley, 2007). That is why over a period of time waste management becomes a serious problem in many countries of the developing economy (World Bank, 2012).

There is evidence of mountains of hazardous and plastic wastes deposited in and around the cities of developing world (Shivji, 2023). One of the best examples a big dumping site on the outskirts Asmara city (Eritrea Green Energy and Waste Recovery EGEWR, 2011). Municipal Corporation is the sole major body to manage solid waste from source of origin to the disposal sites in Asmara city of the State of Eritrea. Municipal body usually collects waste through the two different methods i.e., curbside (house-to-house) collection method and the second one wastes in bulk waste collection containers. The solid wastes generated from each household and collection sites are collected in small containers, sacks and cans before it reaches to the final disposal sites (EGEWR, 2011).

Solid waste- includes from household preparation, cooking and serving of food; market refuses handling, storage and sales of product and meals etc. Non-biodegradable solid waste or rubbish (plastics, rubber, metal, glass, ceramics etc.) is also generated from different sectors of economy and services (Kiyani and Ikizoglu, 2020). There is lack of awareness and policy challenges in its management in Eritrea. Usually municipal garbage-wastes are mixed together become hazardous after its disposal to the dumping sites and nearby regions when there is no mechanism of proper waste management in greater Asmara region of Eritrea. Asmara city region is expanding fast due to increase in diverse economic activities and high rate of urbanization in recent years. Therefore, solid waste management becomes major challenges for the municipal body.

Municipal solid waste disposal created serious threats to both flora and fauna nearby low-lying regions close to the dumping sites (Abubakar et al. 2022). There is report of contamination of soil and water in and around greater Asmara region (Mihretab & Taibao 2018). Waste/garbage and their related problems intensify during rainy season when heavy rainfall cause washing and mixing of these wastes in it and spread nearby region. This problem become more acute due to its altitude as most of the nearby regions around greater Asmara is low-lying areas. Thus, when solid waste is being mix with the rainwater and percolate nearby region contaminates forested-land, water and soils. Various methods like land-filling, incineration and composting have been used for waste management, but none of them fully satisfy the increasing amount of municipal waste and their management in the city (Asmerom, 2021). Therefore, solid wastes are dumped at dumping sites in various locations around the city.

The bulk container collection sites are not also properly prepared in the city region. Most of them are not designed to protect the dispersal or removal of wastes by wild animal, wind, rain or children. They have no foundation or basement and fence at the

collection sites except a hospital in the Dembe Sembel complex of the Asmara city. The amount of the solid waste collection is increasing from year to year when it is compared to the previous year which is 7757 thousand tones in 2007 to reach 16,548 thousand tone in 2017 (Maekel administration, 2018). The increase in the dumped waste is mainly due to the expansion of the city and population growth, increasing income, change in the urban lifestyle etc. Other key determinants in the increasing amount of waste include changes in economic structure– as well as demographic profile of the population (Nguyen et al., 2020; Khan, 2023).

Asmara city is experiencing unprecedented growth in recent years due to post independence reforms and developmental schemes initiated by the government of the State of Eritrea (Tekle and Ogba, 2008). In recent years large urban infrastructural developmental projects along with the improvement in living standard have severe impact on the nature and types of waste generation in the city. The limitation of public awareness along with the increasing amount of non-biodegradable material in the municipal wastes poses a challenge for the environmentally sound management of MSW (Pandey, 2024). Eritrea has the limited waste treatment and recycling services. This micro research will try to examine nature and types of waste generation and their disposal and management in the Asmara city with the following objectives:

1. To assess the amount and nature of waste generation in different regions of Asmara city.
2. To examine the kind and mechanisms of solid wastes management practices in the study region.
3. To identify the problems and difficulties of solid waste management in the city and suggests remedial measures for effective and sustainable waste management.

Profile of the Asmara City

Asmara was made the capital city of colonial Eritrea in preference to Massawa Governor Martini in 1897. Asmara is by far the largest city in Eritrea, with the estimated population of 0.8 million (EENI Global Business School n.d.). From administrative point of view the study region have been divided into thirteen local sub zone administrations normally known as Local Area Administration (LAA). It is located at the top of Eritrean highlands on the eastern edge of the escarpment with an elevation of 2350 meters above sea level. The city is located in 15° 17' N latitude and 38° 55' E longitude. The mean maximum and minimum temperature reaches 23°C and less than 10°C respectively (MOA, Asmara 2016) with a mean annual temperature of 15.6° C. All nine ethnic groups of Eritrea lives in Asmara city and among them, majority are from Tigriya Ethnic group (Pool, 1980).

Asmara was developed from the union of four villages (Arbaete-Asmara) that took place during 12th century (Jan & Zölzer, 2012). Most of central Asmara was built between 1935 and 1945 during Italian colonial period. The city has been regarded as "new Rome" or "Italy's African city" due to its quintessential Italian touch, architecture, wide-streets, piazzas and coffee bars (Italian Asmara, 2018).

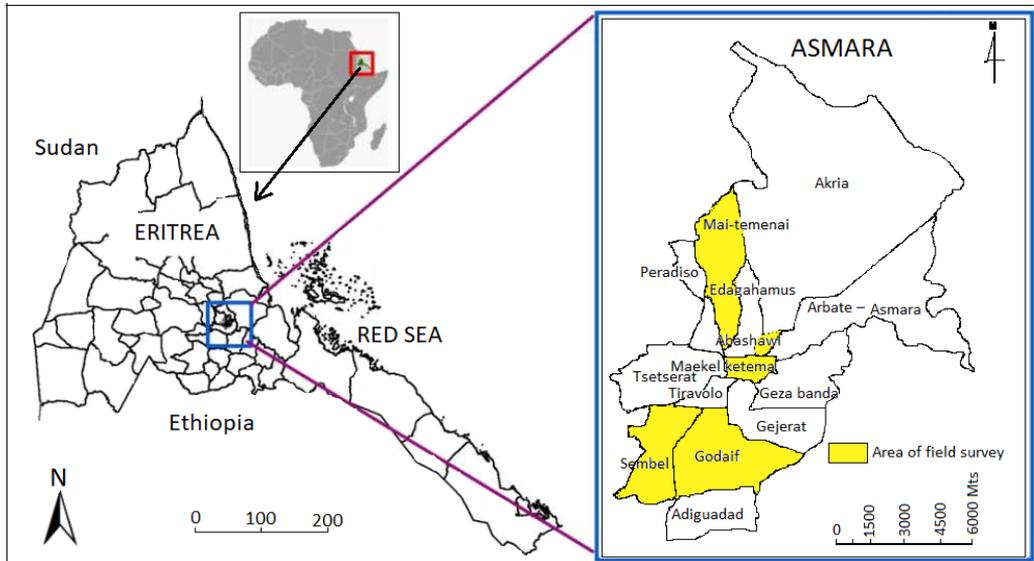


Figure 1: Eritrea (Asmara).

Source: MoLWE, Department of Land, 2018; EMIC, 2018.

Asmara was developed from the union of four villages (Arbaete-Asmara) that took place during 12th century (Jan, K & Zölzer, N., 2012). Most of central Asmara was built between 1935 and 1945 during Italian colonial period. The city has been regarded as “new Rome” or “Italy's African city” due to its quintessential Italian touch, architecture, wide-streets, piazzas and coffee bars (Italian Asmara, 2018).

Background of Asmara Solid Waste Management (SWM)

Asmara cleaning and sanitation unit work under Zoba Maekel Administration. In the past, the sanitation unit was working under Italian government by Naschit, Anenima Company on the contract basis. The dumping sites for the waste disposal have changes with the evolution and growth of city.

- 1st- from 1930-1933, waste dumping state was in Edaga humus.
- 2nd-from 1934-1941, waste dumping site was in the area behind today's sanitation unit and Garage office.
- 3rd –from 1941 onwards, the dumping site changed to Adi-Abeito.
- 4th –in 1946, the dumping site changed by British government from Adi-Abeito in to the today's dumping site (Scarico) Betghiorghish for about 78 years and still it is working.
- 5th–sanitation of Asmara at the time of Hailesilasie regime was believed to be very clean and satisfactory.
- 6th –at the time of Derg regime in Eritrea (after 1974), sanitation of Asmara was in a bad condition due to Carelessness and lack of sanitation Equipment. After independence, with the expansion of Asmara and its population increase (urbanization), the government brought additional manpower, machineries, waste carrying trucks, waste compressor trucks etc. were bought to improve the sanitation of the city and its nearby areas. But with increase in population of Asmara and its expansion, lack of waste disposal equipment and others, the sanitation of the city is not fully under control.

2 Methodology

The present study is based upon primary and secondary sources of information. Secondary data have been generated from the sanitary unit of Municipality of Asmara, Ministry of land and environment, Maekel administration, documents, archives, internet and books.

Primary data have been collected from five administrative regions (LAA-Local Administrative Area) of Asmara city out of total thirteen municipal administrative regions. The five municipal areas were purposely selected based on distribution of large number of houses (different social and economic categories), business activities, slaughter houses, hospitals, restaurants and population size and their nature.

Three tier field survey have been conducted i.e., at firsts level household survey from local administrative area, second level municipal workers were interviewed and at third level different institutions of the Asmara city- such as factory, hospitals, and restaurant etc., to get the clear status of waste generation from Asmara city and their final disposal.

At first level from each administrative area of Asmara city-total 50 households randomly selected for interview. Thus total 250 sampled households were selected from all five sampled local administrative area of Asmara city. Second level 50 municipal workers' have been identified in order to answer the questionnaires who are engaged in the collection, transportation, disposal and management of wastes in Asmara city. And third level surveys were conducted from restaurants, hospitals, colleges, factories, slaughterhouses to assess the role of different sectors in waste generating and their management.

Survey data collected from questionnaire were processed into simple table format using Microsoft Excel Sheet. Further bar graph and table of data were prepared to show the result of field observation. Moreover, location distribution maps of waste generation were prepared with the help of QGIS and Microsoft Paint.

3 Results

3.1 Methods and nature of Solid Waste Disposal SWD

Waste generation methods in Asmara city usually go through primary collection, secondary collection, processing and finally disposed to dumping sites. Asmara is one of the first African cities to install a planned sewage system. Yet its liquid waste collection and disposal system is presently not in good state (Asmara Water Supply and Sewerage Project, 2007). Moreover, in the last 78 years, solid waste disposal in the city has been unorganized and lacks sustainable planning in its management (Asmait, 2016). Thus, as a result, a big dumping site developed east of the city along with other minor (iron, building material etc.) dumping sites at various locations in and around the city of Asmara.

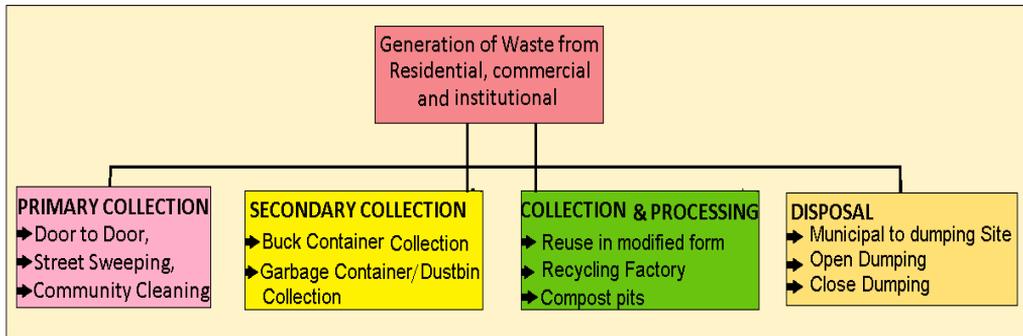


Figure 2: Channels of waste generation and their management in Asmara city
Source: Field survey, 2018.



Figure 3: Asmara dumping site.
Source: EGEWR, 2011.

The main components of the solid wastes disposed off to the final disposal site of Asmara city located at Betghiorghish are organic components such as food wastes, paper, cardboard, plastics, textiles, rubber, leather, yard wastes, wood etc and inorganic components such as, glass, tin cans, aluminium, other metal, dirt, ash etc. Furthermore, it is noted that the residential waste makes up the greater percentage of the total solid wastes generated in the community of Asmara city (Table-1). The higher percentage of municipal waste with diverse nature is major challenges in its management as experiencing mostly in North- East Africa and other developing world (Shafy and Mansour, 2018).

Table 1: Solid waste composition by source.
Source: Sanitary unit of municipality Asmara, 2018.

Source	Sources include	Proportions (%)
Residential	All household and small shops waste	70
Industrial	All factories, slaughterhouses, garages, workshops and handicrafts	14.02
Commercial and markets	Market place wastes, entertainment centers, tea or coffee shops	4.4

Institutional	Government and governmental offices, international organization, College and schools	1.6
Hospital	Hospitals and health centers and pharmacies	1.6
Others	Street sweepings, plant trimmings, other constructions etc.	5.0
Total		100

3.2 Waste Generation in Asmara City

Spatial variation in the amount of solid waste generation depend upon growth and density of population, socio-economic structure of the people, level of urbanization, rise in the standard of living and stages of demographic transition (Shafy and Mansour, 2018). Asmara city have highly uneven distribution of waste generation and their collection. The amount of waste generation varies from one region to another local administrative area of the city. The northern local administrative area (LAA) such as Akria and Arbate-Asmara region generates highest amount of total waste (more than 200 q/d) while Maekel Ketema, Tiravolo and Adiguadad administrative region of central and southern part of the Asmara generates lowest solid waste collection (less than 100 q/d) in the city. Moreover, remaining administrative region of Asmara comes as medium range of waste generation (between 100 to 200 q/d) (Figure 5).

Moreover, per capita Asmara city generates less than 0.6 kilogram of solid waste i.e., equal proportion of per capita wastes as in the lower income countries (India, Bangladesh and Myanmar). While four administrative regions of the Asmara city generates more than 0.6 kilograms of solid wastes per capita is equal to waste generation from middle income group countries (Figure 6). The waste generation rates in Asmara city are equal to the low-income countries and much lower compared to middle income and developed countries (Matheson, 2019).

However, lifestyle changing very fast, especially in the high-income group of the people would use of more packaging material and per capita waste would increase. With the fast urban population growth in Eritrea at the rate of more than 4 per cent per annum -fourth highest among the African countries (Cowling, 2024), the yearly increase in the overall quantity, locality and per capita of solid waste in the city will be higher much higher in next ten years when total population of city will be doubled. The city has been constructed to habitat hundred thousand population by the Italians (Tewelde and Cabral, 2011). But after independence the populations the city has increased many folds. Presently the city inhabits more than half million population. There is positive relationship between population growth and waste generation according to the data generated. The population is expected to increase so the wastes generation also. It is estimated that by 2030 the population of the Asmara city will reach 1,034,517 and total amount of wastes will be generated to 44,059 tons.

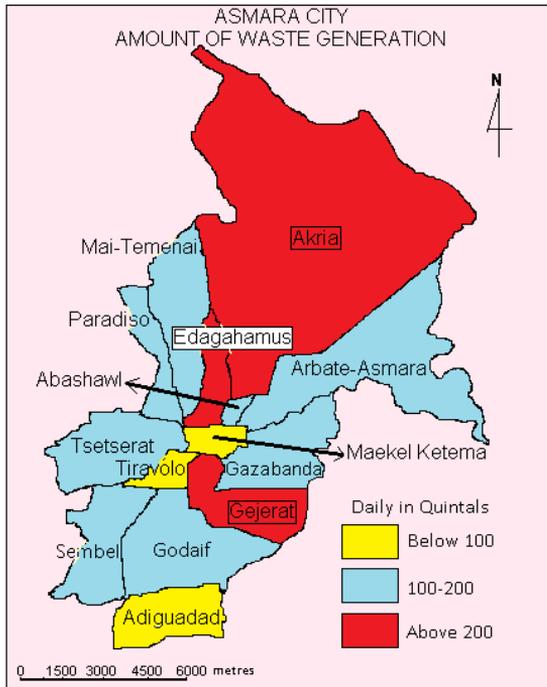


Figure 4: Amount of wastes generation.
Source: Maekel administration, 2018.

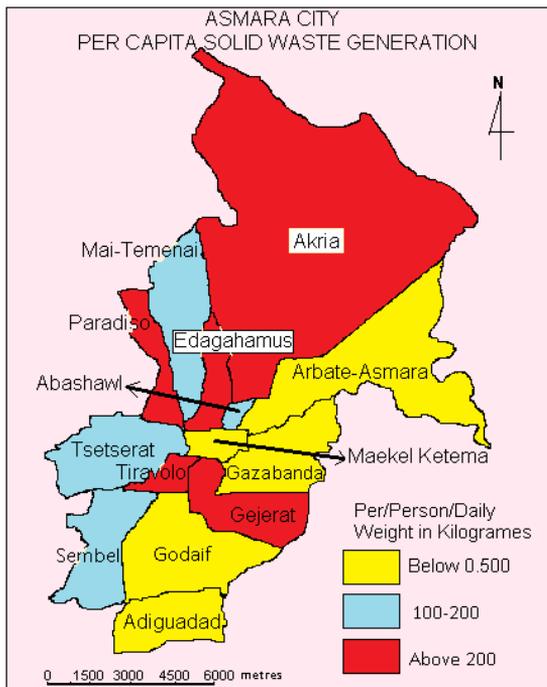


Figure 5: Per capita solid waste generation in Asmara city.
Source: Maekel administration, 2018.

Table 2: Total amount and per capita waste generated in Asmara city.

Source: Maekel administration, 2018.

	Sub zone	Waste generated		
		Total amount in Quintals	Household waste/day (kg)	Person/day (kg)
1	Tsetserat	105	2.5	0.575
2	Tiravolo	96	2	0.450
3	Berik	96	1	0.215
4	Mai-temenai	130	2.5	0.590
5	Peradiso	200	3.5	0.772
6	Godaif	190	2	0.422
7	Abashawl	200	2	0.500
8	Adiguadad	54	2	0.385
9	Maekel ketema	95	2	0.447
10	Sembel	100	2.5	0.520
11	Edagahamus	225	3	0.666
12	Akria	330	3	0.674
13	Gezabanda	181	2	0.444
14	Arbate –Asmara	240	3	0.671
15	Gejerat	173	2	0.449
Total		2415	2.3	0.67

Table 3: Trend of wastes dumped from Asmara city to the dumping sites.

Source: Maekel administration, 2018.

Year	Asmara population	Per capita (kg/day/cap)	Generated 1000 (t/year)
2007	489,825	0.43	7757
2008	506,099	0.45	8369
2009	522,905	0.47	9029
2010	540,260	0.49	9741
2011	558,182	0.52	10,508
2012	576,690	0.54	11,335
2013	595,802	0.56	12,227
2014	615,536	0.59	13,189
2015	635,915	0.61	14,225
2016	656,957	0.64	15,343
2017	678,685	0.67	16,548

3.3 Solid waste generation and household socio-economic profile

There is direct relationship between solid waste composition and socio-economic activities of the community (Miezah at al. 2015). Municipal Waste Generation and their configuration are highly impacted by socio-economic profile of the people including size of the family and house size, income generation and the nature of employment. Socio-cultural, economic, legal, political and environmental factors as well as the available resources are the main issues that affect the Municipal Solid Waste MSW management in all countries (Kumar, 2011).

From the field survey it has been found that majority of the respondents in Godaif, Maitemenai and Sembel (Enda korea) are working in government sectors. While majority of residents of Abashawil and Maekel ketema are engaged in business activities. Size of the family also varies from one administrative area of the city to another. Except in the Enda Korea complex from the study sample all the administrative regions have large family size ranging between five to seven total numbers of family members. Total number of house size has strong relationships in the amount of wastes generations. However, among all the socio-economic variables, level of income has the positive relationships with the nature and types of households' wastes generation and their management and disposal (Deshpande et al., 2024).

Income is one of the significant variables for waste generation in the urban centers, therefore, from all the five sample administrative regions four categories of households' income levels have been identified as very low-income group, low income group, medium income group and high income group households. Based on the household income each sampled administrative region has been designated categories according to the majority of residents' income. Very low-income group categories are insignificant in the sampled areas; therefore it has been excluded from the categories. Thus only three categories of income groups have been outlines as low, medium and high income group in Asmara city. Low-income group region is Abashawl (50% low income people) and Godaif, Maitemenai and Sembel residential complex have been designated as medium income group region. While Maekel Ketema designated as high-income group region (Figure 8). Amount of waste generation recorded higher among the high-income group people comparison to low and medium income group people in the study region.

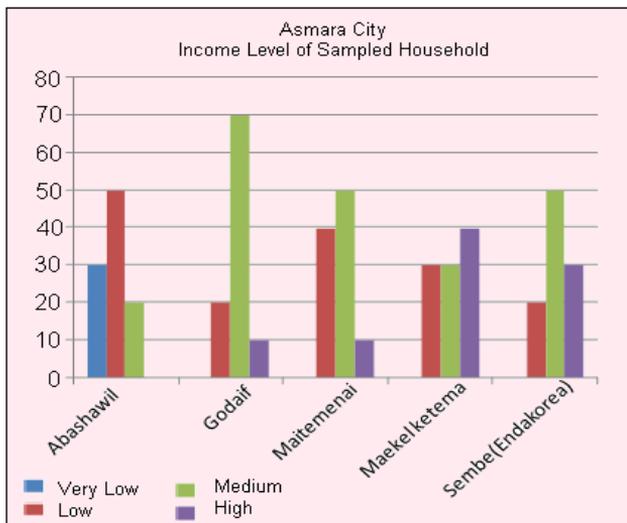


Figure 6: Income levels of sampled areas.

Source: Field survey, 2018.

Residential waste: Residential domestic waste forms the bulk of all resources of solid waste produced in the city. Further among the household, high-income groups use more packaged products, resulting in higher volumes of plastics, paper, glass, metals and textiles. Changes in waste composition can have a significant impact on waste management practices. Wastes may also contain hazardous such as pesticides,

paints, used medicine and batteries. Compostable organics include fruits, vegetables and food waste. Healthcare waste contains disposable syringes, sanitary materials and blood containing textiles and is governed by the Biomedical Waste (Management and Handling) Rules and should not be mixed with MSW (Acharya et. al., 2014). However, in the study region all the wastes including infectious medical waste mix with other waste before final disposal at dumping sites.

The composition of MSW produced by Asmara city dwellers is approximately 64.14 wt.% organic, approximately 11.7 wt.% of paper wastes, with approximately 8.64 wt.% is plastic materials, 2.62 wt.% is glass, 1.96 wt.% is metal and remaining other waste materials generated from the Asmara city dwellers. Their proportions vary among the high, medium and low-income group of the region. Low-income group localities have high proportion of organic matter in comparison of higher income group region where proportions of packages materials, plastic and steel materials are relatively in higher proportions (Table 4).

Table 4: Composition of solid waste in Asmara.

Source: Field survey, 2018.

Sampled Region	Organic	Paper	Plastic	Glass	Metal	Others
Abashawil	71.3	6.8	4.1	2.7	0	15.1
Godaif	59.7	14.9	11.9	2.2	3.2	8.1
Maitemenai	65.2	10.8	8.7	2.9	1.2	11.2
Makel Ketema	57	15	10	2.7	3.1	12.2
Sembel R.Complex	67.5	11	8.5	2.6	2.3	8.1
Average	64.14	11.7	8.64	2.62	1.96	10.94

Households' Storage: Solid waste can create problems inside the house if it is not properly stored in standard storage containers. Normally, containers should be strong, watertight, insect-resistant and tight fitting covers and should not exceed 60 pounds in weight when full. Table 5 shows that distribution of sampled household according to the nature of storage household waste inside the house. Majority of the households contains their waste in closed standard container (53.4 per cent) while 36 per cent residents keep their waste in open local container. However, open container storage varies from one region to another region in the study area. The waste contain in open container can attract flies in the house. So, they have more flies in their kitchen or in food preparations areas. Study found that low-income residential area has higher proportion of open household storage container in comparison to high income residential areas (Sembel residential complex) where higher proportions of closed standard garbage containers inside the house during the survey period. This may be due to the areas inhabited by high income people who are educated and know about the hazards of keeping wastes in open containers.

Table 5: Mode of household storage.

Source: Field survey, 2018.

Sampled Region	Open container	Closed standard container	Do not store	Total
Abashawil	56	20	24	100
Godaif	36	53	11	100
Maitemenai	56	35	09	100
Makel Ketema	25	70	05	100
Sembel R.Complex	03	95	02	100
Average	36.4	53.4	10.2	100

Households' disposal of waste: Safe disposal of household waste is very important in order to keep the locality environment surrounding clean. The households disposed of waste through four different ways i.e. disposing to official collection points, house-to-house collection by the municipality transport, dispose outside the house from where municipality vehicles collect it and dispose with the help of others by paying money according to the convenience, availability, and self-management.

Table 6: Modes of disposal of garbage from residential areas.

Source: Field survey, 2018.

Sampled Region	Waste disposal		
	Official Collection point	House-to house collection	Road side or Outside the house
Abashawl	00	00	76
Godaif	18	77	4
Maitemenai	17	68	15
Makel Ketema	27	58	15
Sembel R.Complex	97	00	03
Average	35.5	42.6	21.8

From the table 6 it seems that large numbers (almost 78%) of Asmara residents dispose their household wastes officially either official collection points or through house-to-house collection by the municipality garbage collectors. Only low-income group locality Abashawl where there is no such provision by the administration dumps large amount of waste outside the houses or they higher the people to dispose off their wastes to the other localities.

Waste/ garbage in the localities: Table 7 showing the amount of garbage found in the localities of sampled areas of Asmara. Amount of garbage found in the localities depends upon the waste management by the municipality and sanitary department of the Asmara city as well as by the management of community-based campaign. In general Asmara city is said to be clean city but, some areas are reported of wastes in some proportions due to poor involvement in sanitation program, irresponsibility and carelessness of some locality residents etc.

Table 7: Existence of garbage in Residential areas.

Source: Field survey, 2018.

Sampled Region	Existence of garbage				
	Spread everywhere	Not seen	Huge quantity	Small quantity	Negligible
Abashawl	79	21	12	85	03
Godaif	17	83	20	15	65
Maitemenai	21	79	18	17	65
Makel Ketema	27	73	07	12	81
Sembel R.Complex	05	95	02	08	90
Average	29.8	70.02	11.8	51.4	36.6

From the table 7 it has been found that very few areas complain the waste spread in their localities. Usually wastes are frequently removed by the concerned persons. Except Abashawl no part of the city where household wastes are spread on the streets according to the respondents' response. The Abashawl is the dirtiest areas of the city. The reasons could be lack of curb sides, trucks, bulk containers, lack of efficient administration in addition to the above-mentioned reasons. While most of the other localities are relatively clean.

Community Participation: Community based campaign for environmental sanitation is one of the major means to create awareness among the people about amount of wastes in their localities (Jena, 2018). Eritrea has strong social welfare campaign in almost all the sector of social life. Time to time Eritrean communities of localities themselves organize a cleaning campaign in order to keep their localities clean. In the process of cleaning campaign, from every household a member is need to take participation in cleaning and landscaping of their localities. As per the finding of the field survey, most of the respondents said that they are engage in sanitation of their local area once per month, while the rest 11% said that this program is carried out once in three months.

3.4 Problems SWM and level of satisfaction

Solid Waste management has huge expenditure in developing nation cities. Management of waste generally accounts up to 50 percent of municipal operational budgets. (Zohoori and Ghani, 2017). Despite efforts high expenditures, cities just collect between 50-80 per cent of solid waste. Treatment or reuse of waste receives less attention in developing countries due to lack of fund. Therefore, up to 90% of waste collected in developing cities disposes off in open dumping sites without their treatment (Cointreau, 2008; Medina, 2010).

Table 8: Problems of waste management.

Source: Field survey, 2018.

Problems	Very serious (%)	Serious (%)	Not so serious (%)	No problem (%)
Inadequate service coverage	42	52	06	-
Lack of trucks and curbsides	24	64	12	-
Lack of equipment	24	52	24	-
Lack of legislation	08	40	50	02
Poor public co-operation	20	54	20	06
Poor co-operation of gov't agencies	12	48	36	04
Poor response to waste minimization(reuse/recycle)	92	06	02	-
Lack of planning	08	56	20	16
Lack of service quality	10	40	46	04
No proper institutional set up	02	30	68	-

Moreover, in areas where there is poor collection especially low and very low income localities of Asmara (Abbashawal and Maitemunai) inhabitants dump their rubbish on public space nearby or simply burn it in their backyards. Even open dumping of the waste illegally is the most popular disposal technique like other developing nation. Waste minimization (reuse /recycle) is one of the very serious problems facing the city since long time. Furthermore, lack of service coverage, lack of trucks/curb sides, lack of equipment, lack of public co-operation and lack of planning are some of the serious problems ever facing in the process of solid waste management.

The level of satisfaction regarding solid waste collection and their management was processed and presented in Figure 9. The wastes are handled, stored, collected and preparation of disposed of to the dumping site, which can pose risks to the micro-environment and to public health near-by disposal site. In urban areas, especially in the rapid urbanizing cities of the Eritrea, problems and issues of Municipal Solid Waste Management (MSWM) are of immediate importance. Both government management mechanisms and community base awareness have positive effects on wastes collection, transportation and disposal chains in the Asmara city. Abashawil, Godaif and Maitemenai where there is higher proportion of very low-, low- and medium-income group resides. In all three Local Administrative Regions (LAA), residents have poor approach towards waste storage and disposal. They keep their waste in open container in the houses and dispose illegally on the streets and other public spaces. Moreover, these areas improper waste disposal. All the above regions have high level of unsatisfactory response about the wastes management in their localities. Figure 9 shows that economic and social factors are among the major factors affecting the amount and management wasters in the localities of Asmara and their resultant level of satisfactions.

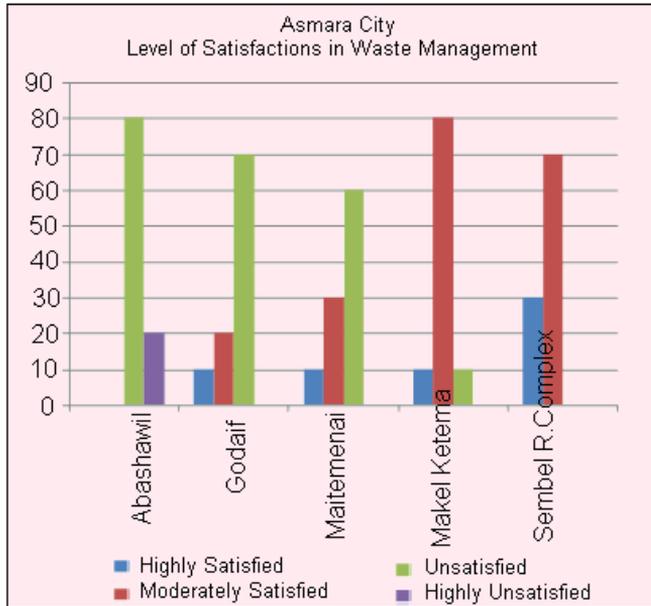


Figure 7: Level of satisfactions in waste management.
Source: Field survey, 2018.

4 Conclusion

Methods of waste collection to final disposal in Asmara city go through various levels before final disposal at only dumping site at Betghiorghish. Among the various sources of solid wastes, residential wastes contribute almost 2/3 of the total wastes in Asmara city. The waste generation rates in Asmara city are similar to the low-income countries and much lower compared to middle income and developed countries. In recent years, population growth has the positive relationship with solid waste generation in the Asmara city. Municipal Waste Generation and their configuration are highly impacted by socio-economic profile of the people. Low-income group localities have high proportion of organic matter in their waste in comparison of higher income group region where proportions of packages materials, plastic and steel materials are relatively in higher proportions waste.

From the field survey, it has been assessed that at household level almost 64 per cent are organic wastes. Together organic and paper wastes consist of total 75 per cent of household waste generated in the city. Almost 25 per cent of are recyclable wastes. However, wastes generated at household levels are not separated at primary levels rather all of them collected together at collection point and they dumped together at dumping site. It has also been found that income has direct relation with the management of waste, high income residential areas usually keep their waste in closed container as shows their awareness of health and household environmental sanitation.

Study found that the large numbers (almost 78%) of Asmara residents are disposes their household wastes at designated location managed by Asmara Municipality Corporation. There is also culture of community cleaning in each local administrative areas of the city. From the field survey, it has been found, management and services

of waste in each LAA in the city is not same. It is general trend, higher economic and government official residential areas are given priorities in services and amenities for collection of waste and their final disposal. While poorer and fringe areas of the city is being neglected in solid waste collection and their management. Thus, it also reflects in the level of satisfaction in the services pattern of waste management in the city of Asmara.

There is no private organization engaged in the city sanitation program. Asmara Municipality offices take the responsibility of solid waste management including the street sanitation. However, some localities in the city poor management in waste collection and disposal. Abashawil has no proper collection point and there is no systematic support from the municipality in waste collection and their disposal. Solid wastes collected from different waste generation sectors of the city such as residential, commercial, institutional, industrial etc. are dumped at Beitghiorghish with poor separation and recycle mechanism. Only small recycle unit of Eri-biodiesel recycling unit works for experimental level.

All kind of wastes dumped at dumping site are an open area without fence. Since it is situated along Asmara-Massawa road, it is becoming threat to the local inhabitants and tourists due to its smell and smokes of burned wastes. Apart from this, there is also a dumping site on the way to Asmara-Dekemhare road just beside the Asbeco construction company for the construction materials. It is an open dumping site exposed to wind and rainfall. Both the dumping sites do not have proper recycling waste management regulations. This is serious threat to the outskirts and local inhabitants' biodiversity of greater Asmara city region.

Recommendations

The rapid growth of population and changes in the lifestyle of the people from time to time have resulted in increasing amount in the nature and quantity of solid wastes generation in Asmara city. The wastes generated from different wastes generating sectors are not properly separated rather all together dumped at dumping sites. To overcome the difficulties and constraints it faces, the branch of solid waste management unit requires continuous attention, public awareness, provision of adequate equipment, manpower and investment from the department of social services and environmental sanitation branch. The future of environmental sanitation of the city as a whole will depend on how those issues are addressed by the combined efforts from the public, government, other stake holders, institutions and other sanitation units of the city. The following recommendations are important for improved solid waste management in the city:

- Society awareness should be increased through different social Medias and /or seminars about solid waste management.
- Since solid waste management operation is complex, it requires a skilled man power, therefore; adequate training should be given to the workers and municipality staff members to improve their skills.
- The number of street cleaners should increase to include areas which are full of wastes due to lack of street cleaners.
- Skin (hide) is one of the wastes polluting the city today especially during holy days. So, the concerned bodies should take care of these wastes.
- Introduce efficient segregation mechanism at household levels, collection centres and dumping sites so as to reduce the amount of waste, to composite the organic waste and re-use or recycle the other non-bio-degradable wastes.

- As the population size and amount of wastes are increasing, the city sanitary units should propose to get additional waste collecting trucks and bulk containers for effective and efficient waste collection.
- The government should allocate sufficient annual budget and concerned authorities have to work very hard on improving human, technical, financial and institutional capacities of the city sanitary unit for effective solid waste management.
- In general, there is an urgent need for the preparation of comprehensive (integrated) solid waste management plan in the city. All the concerned bodies especially the department of environmental sanitation need to develop national guidelines for safe disposal of municipal solid waste.

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Povzetek

Članek obravnava upravljanje s komunalnimi odpadki v Asmari, Eritreja, kjer urbanizacija, vse višji standard in spremembe življenjskega sloga povzročajo naraščanje količine odpadkov. Asmara se sooča z velikimi izzivi pri ravnanju z odpadki, zlasti zaradi neurejenega odprtega odlagališča v Betghiorghishu, ki ogroža biotsko raznovrstnost. Študija, izvedena z vprašalnikom, je pokazala, da obstaja pozitivna povezava med urbanizacijo in nastajanjem odpadkov. Prav tako so razlike v količini in vrsti odpadkov med različnimi gospodarskimi sloji, pri čemer višji dohodkovni sloji ustvarjajo več odpadkov. Za obvladovanje teh težav je nujno celostno trajnostno načrtovanje upravljanja s komunalnimi odpadki. V članku so obravnavane tudi metodologija raziskave, analiza problemov pri upravljanju z odpadki, skladnost z obstoječimi predpisi ter priporočila za izboljšanje sistema zbiranja in ravnanja z odpadki v Asmari.

Terensko delo v geografskem izobraževanju v Sloveniji

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Izvelek

Ker je terensko delo kot oblika neposrednega stika s predmetom geografskega preučevanja, pokrajino, zelo pomembno v raziskovalnem in v učnem smislu (tako pri geografskem raziskovalnem delu in pri študiju geografije, kot tudi pri učenju geografije na različnih izobraževalnih nivojih), so v prispevku opredeljeni širši izobraževalni konteksti geografskega terenskega dela, predstavljena njegova zastopanost na nivoju primarnega, sekundarnega in terciarnega geografskega izobraževanja v Sloveniji ter na podlagi empirične raziskave realnega kurikulumu opisana pojmovanja sodelujočih učiteljev geografije o terenskem delu, koristi in problematike njegove izvedbe v (geografskem) izobraževalnem procesu ter nekatere druge realnosti njegove izpeljave.

Ključne besede

geografsko izobraževanje, terensko delo, učenje na prostem, Slovenija

Abstract

Field work in geographical education in Slovenia

As a form of direct engagement with the subject of geographical study—the landscape—field work holds significant importance both in research and educational contexts. This applies to geographical research, academic study of geography, and across various educational levels. This article defines the broader educational contexts of geographical field work, presenting its prevalence in primary, secondary, and tertiary geographical education in Slovenia. Drawing on empirical research into the actual curriculum, it describes geography teachers' perceptions of field work, its benefits, challenges in implementation within the (geographical) educational process, and other practical considerations of its execution.

Keywords

Geographical education, field work, outdoor learning, Slovenia



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1 Uvod

Iz koncepta geografije izhaja, da je predmet njenega preučevanja pokrajina. Najbolj prvinski in neposredni način preučevanja pokrajine je s pomočjo neposrednega terenskega dela (Rhoads, Wilson, 2010, 27-28), zato je vključevanje te oblike dela v izobraževalni proces eden od ključnih dejavnikov uspešnosti učečih pri dojetanju pokrajine. Z izrazom terensko delo razumemo raziskovanje oz. učenje na prostem, torej skupek raziskovalnih/učnih dejavnosti, ki jih udeleženci raziskovalnega oz. izobraževalnega procesa izvajajo izven matične ustanove. Gre za protipomenko laboratorijskemu, kabinetnemu oz. delu v učilnici (Lipovšek, 2016), kar simbolno kaže grafični znak mednarodnega projekta Learning through Interdisciplinary Field Education (LIFedu) na sliki 1, ki se je posvečal raziskovanju, razvijanju in promoviranju interdisciplinarnega terenskega izobraževanja (Konečnik Kotnik, Žiberna, 2021).

Ker je torej terensko delo kot oblika neposrednega stika s predmetom geografskega preučevanja zelo pomembno v raziskovalnem in v učnem smislu (tako pri geografskem raziskovalnem delu in pri študiju geografije, kot tudi pri učenju geografije na različnih izobraževalnih nivojih), želimo v tem prispevku predstaviti izbrane vidike terenskega dela kot izobraževalnega postopka v primarnem, sekundarnem in terciarnem geografskem izobraževanju v Sloveniji. S tem namenom smo si zastavili sledeče cilje:

- opredeliti izobraževalne kontekste geografskega terenskega dela,
- predstaviti zastopanost terenskega dela na nivoju primarnega, sekundarnega in terciarnega geografskega izobraževanja v Sloveniji in
- na podlagi empirične raziskave realnega kurikulumata opisati pojmovanja sodelujočih učiteljev geografije o terenskem delu, koristi in problematike njegove izvedbe v (geografskem) izobraževalnem procesu ter druge realnosti njegove izpeljave.



Slika 1: Simbol projekta Learning through Interdisciplinary Field Education (LIFedu).
Vir: LIFedu, 2022

2 Metodologija

Pri pripravi prispevka smo se posluževali deskriptivne metode v kontekstu analize literature in virov, povezanih s problematiko terenskega izobraževanja v izobraževalnem procesu. V empiričnem delu raziskave smo uporabili kombinacijo kvantitativnega in kvalitativnega raziskovanja s poudarkom na slednjem. Raziskovalna metoda je bilo poglobljeno anketiranje, izvedeno na vzorcu desetih osnovnošolskih in desetih srednješolskih učiteljev geografije v Sloveniji. S to raziskovalno metodo smo želeli prepoznati misli, pojmovanja, pomene, ki so jih sodelujoči učitelji pripisovali oblikam terenskega dela v izobraževanju ter njihove realne kurikularne prakse. Raziskovalna instrumenta sta bila protokol analize literature in virov ter anketni vprašalnik, ki je bil posredovan naključno izbranim učiteljem. Vprašalnik je vseboval splošna vprašanja demografskega značaja ter sedem vprašanj odprtega in polodprtega tipa, s katerimi smo želeli preveriti

razmišljanja učiteljev o terenskem delu. Široko in odprto zasnovani anketni vprašalniki v okviru manjšega vzorca sodelujočih so nam omogočili kombiniranje kvantitativnega in kvalitativnega raziskovalnega pristopa. Raziskava je bila eden od delovnih procesov v okviru projekta Learning through Interdisciplinary Field Education (LIFEdu), v katerem je sodeloval Oddelek za geografijo Filozofske fakultete Univerze v Mariboru v triletnem obdobju do leta 2022. Njegovi cilji so bili širšega značaja in sicer:

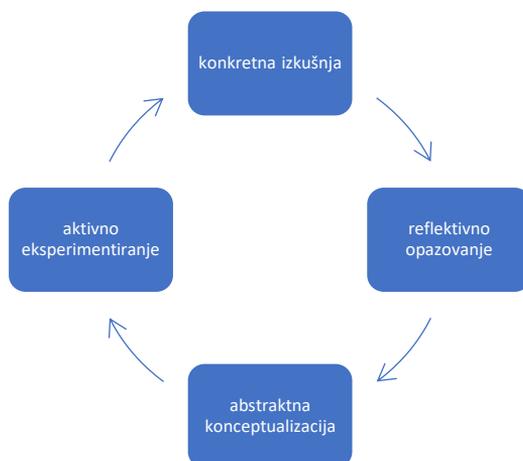
- primerjalno analizirati položaj terenskega izobraževanja v kurikulumih osnovnega, srednjega in terciarnega izobraževanja na Češkem, v Srbiji in v Sloveniji;
- oblikovati predloge za izvajanje terenskega izobraževanja v izobraževalnih programih;
- pripraviti zbirko interdisciplinarnih dejavnosti, primernih za terensko izobraževanje na različnih izobraževalnih nivojih;
- organizirati ter izpeljati tri usposabljanja na treh univerzah (Češka, Srbija, Slovenija) za izvajanje interdisciplinarnega terenskega dela za študente, osnovnošolske, srednješolske ter univerzitetne učitelje (LIFEdu, 2022; Konečnik Kotnik, 2021).

3 Rezultati

3.1 Izobraževalni kontekst terenskega dela

Terensko izobraževanje je neposredno učenje v kompleksnem prostoru, v katerem se sistemsko prepletajo naravne in družbene prvine, zato je terensko delo oblika učnega dela, ki je v geografskem izobraževanju najbolj izkustvena in holistična. Omogoča veččutno zaznavanje celovitega prostora. V času individualizacije in digitalizacije ter s tem svojevrstnega odmika človeka od narave in skupnosti, je pogosto potrebno učeče ponovno učiti stika z življenjskim okoljem, da bi ga zavestno opazovali, razumeli, v njem kakovostno živeli ter delovali trajnostno. Terensko delo tako dodatno pridobiva na svojem poslanstvu.

Ideja terenskega izobraževanja sovпада s ključnimi izobraževalnimi filozofijami, ki so bodisi preživele zob časa in celo postale v trenutni izobraževalni realnosti še posebej pomembne, bodisi so se pojmovno razvile v sodobnosti. Ena od temeljnih je filozofija izkustvenega učenja. Po Kolbu (1984) je izkustveno učenje vsako učenje v neposrednem stiku z realnostjo, neposredno soočanje s pojavi, pri čemer je soočanje proces, v katerem se ustvarja znanje s pretvorbo izkušnje. Tako je znanje po Kolbovem mnenju rezultat transakcije med družbenim znanjem (objektivna spoznanja) in osebnim znanjem (subjektivne izkušnje) v procesu učenja. Po Kolbu je učenje ciklični proces, ki zajema štiri stopnje: (1) konkretna izkušnja, ki vključuje celostno dožemanje pojava/procesa, (2) razmišljujoče opazovanje v smislu skrbnega opazovanja in nepristranskega opisovanja, kjer je pomembno kako stvari/pojavi/procesi delujejo; (3) abstraktna konceptualizacija, ki pomeni nasprotje intuitivnosti, logično sklepanje, sistematiziranje, posploševanje na podlagi pridobljene izkušnje; (4) aktivno preizkušanje ali eksperimentiranje, kar pomeni praktično uporabo in delovanje na podlagi pridobljene izkušnje oz. preverjanje pojmov v novih situacijah s pridobivanjem povratnih informacij.



Slika 2: Kolbov učni cikel.
Vir: Kolb, 1984

Terensko delo sovpada tudi z izobraževalno filozofijo raziskovalnega učenja, ki v vzgojno izobraževalni proces vnaša posamezne elemente znanstvenega dela (Ivanuš Grmek, Javornik Krečič, Čagran, Fošnarič 2011), saj lahko učeči v okviru terenskega dela preko samostojnega raziskovanja v konkretni pokrajini pridejo do (subjektivno ali objektivno) novih znanj, pri čemer se učijo tudi samoorganizacije, vodenja lastnega raziskovanja/učenja in dela, torej spretnosti in sposobnosti vseživljenjskega učenja. Filozofija samostojnega individualnega ali sodelovalnega raziskovanja učečih je blizu filozofiji projektnega učnega dela, katere bistvo je ciljno usmerjeno aktivno reševanje realnih (avtentičnih) izzivov/problemov/tematskih vprašanj, pri čemer so učeči udeleženi v vseh fazah procesa – od pripravljalne faze do načrtovanja projektnega dela, izvajanja tega in interpretacije rezultatov, njihove diseminacije in nazadnje evalvacije in reflektiranja. Ta izobraževalni pristop so izpostavljali že Sokrat, John Dewy, Lev Vigotsky, Jean Piaget, Benjamin Blomm, Jerome Bruner in drugi (Borstner, 2011; Bezgovšek, 2019). Nenazadnje je temeljni ideji terenskega dela sorodna tudi filozofija problemskega pouka, prav tako usmerjenega v reševanje realističnih problemov, ki nimajo nujno enoznačnega odgovora. Problemski pouk vključuje faze evidentiranja oz. zaznavanja problema, opredelitev in formuliranje problema, načrtovanje reševanja problema in postavljanje hipotez, uresničevanje in preverjanje problemskega načrta oz. hipotez ter fazo formulacije in posplošitve rešitve problema (Bognar Matijevič, 1993; v Kokalj, b.d.) . Znotraj tega velja posebej poudariti prednosti, ki se kažejo v višjih miselnih procesih, še zlasti pa v razvijanju ustvarjalnosti.

Navedene izobraževalne filozofije so deloma medsebojno prekrivne in povezljive (npr. raziskovalno učenje je lahko organizirano po principu projektnega učnega dela ter vključuje realistično problemsko vprašanje), deloma pa vključujejo določene specifične karakteristike oz. lahko izključujejo posamezne elemente druge. Kakorkoli že - mozaik navedenih izobraževalnih filozofij je lahko izvor ustvarjalnih idej za didaktično organizacijo in osmišljanje geografskega terenskega dela. Naj dodamo še, da aktivna vključenost učečih v geografsko terensko delo podpira njihovo celostno (osebno, izobraževalno) prisotnost v danem trenutku in prostoru, torej je povezana tudi s filozofijo čuječnega učenja (Shapiro idr., 2006; Knez, Konečnik Kotnik, 2017; Konečnik Kotnik, Žiberna, 2021), ki v sodobnem času zelo pridobiva na

pomenu. Pri tej je bistveno pozorno zavedanje tega, kar se dogaja v sedanjem trenutku (v osebi, v lastnem procesu učenja, s konkretnim geografskim prostorom) ter iz tega izhajajoča samoregulacija in potencialno spreminjanje (sebe, lastnega procesa učenja, ravnanja z oz. v geografskem prostoru).

Če pogledamo na terensko delo z vidika splošnih izobraževalnih smernic, ki za doseganje kakovostnih izobraževalnih rezultatov poudarjajo aktivno vključenost učečih, lahko izpostavimo klasifikacijo metod terenskega dela po Kentu, Gilbertsonu in Huntu (1997), ki ločijo:

- opazovalno terensko delo (zahteva pretežno prisotnost učečih, ne pa toliko njihovih aktivnih delovnih postopkov sodelovanja ter pogosto poteka v večjih skupinah; lahko gre npr. za relativno hitro premikanje iz ene na drugo lokacijo, kjer vidimo veliko število prostorskih elementov in pojavov (»tradicionalna« izvedba ekskurzije), vendar je ogled teh razmeroma površen; delo na takšen način je uporabno npr. za uvodno spoznavanje terena; učinkovitost opazovalnega terenskega dela se povečuje, če so učeči v večji meri aktivno angažirani, pri čemer je v primeru opazovalnega terenskega dela pogosta dopolnitev aktivnosti učečih z delovnim listom ali karto, kjer rešujejo vnaprej postavljene naloge);
- sodelovalno terensko delo (praviloma gre za delo v manjših skupinah in v primerjavi z opazovalnim terenskim delom vključuje več eksplicitne delovne aktivnosti učečih; učitelj pogosto določi aktivnosti in skrbno nadzoruje tudi končno analizo dela, lahko pa tudi zgolj pomaga oblikovati projekt in nudi pomoč ter metodološko usmeritev v naslednjih fazah);
- opazovanje z neposredno udeležbo (gre za metodo terenskega dela, pri kateri je opazovalec del določenega družbenega življenja, s čimer neposredno pridobi podatke o dogajanju v določeni družbeni sredini; gre za »sistem zbiranja podatkov v specifičnem obdobju/času, ki temelji na opazovanju, poslušanju in spraševanju ljudi, medtem ko ti sledijo svojim vsakodnevnim aktivnostim, raziskovalec pa v tem času privzema vlogo iz njihovega konteksta in delno postane član skupine« (Lavrič in Naterer, 2010, 11); opazovanje z udeležbo je metoda, kjer učeči v določenem obdobju intenzivno sodelujejo v aktivnosti neke organizacije, pri čemer pridobijo globlji uvid v njihovo realnost (npr. humanitarne, komercialne, vladne organizacije, lokalne in nacionalne okoljske agencije) (Simonič, 2021).

3.2 Terensko delo v izobraževalnem kurikulumu in didaktičnem raziskovanju v Sloveniji

Sedaj veljavni slovenski osnovnošolski učni načrt za geografijo (Kolnik, Otič, Cunder, Oršič, Lilek, 2011) in gimnazijski učni načrt za geografijo (Lipovšek, Cunder, Dragoš, Kolenc Kolnik, Lilek, Oršič, Otič, Polšak, Resnik Planinc, Škof, 2008) predstavljata terensko delo kot skupek učnih dejavnosti, ki jih učenci ali dijaki opravljajo izven učilnice oz. šole. Pri tem so mišljene ekskurzije, a tudi opazovanje pokrajine v neposredni okolici šole oz. didaktično raziskovanje – odkrivanje za učeče novih spoznanj, lahko pa tudi raziskovanje v ožjem strokovnem smislu odkrivanja novega. V slovenski geografski didaktični literaturi se terensko delo pojavlja kot »kot sintagma, ki jo razumemo, uporabljamo in ni pomensko vprašljiva.« (Lipovšek, 2016, 7). Razume se kot »didaktični postopek, ob katerem učenci spoznavajo ne le zakonitosti v pokrajini, ampak se naučijo tudi veščin neposrednega raziskovanja pokrajine, ne le geografskega, za potrebe geografije, ampak splošnega, medpredmetnega, življenjskega.« (prav tam, 9). Podoben pomen pripisujeta terenskemu delu tudi slovenska učna načrta za zgodovino in biologijo (Kunaver, 2011;

Vilhar, Zupančič, Gilčvert Berdnik, Vičar, Zupan, Sobočan, 2011) – torej gre za »sestavino pouka, ki temelji na opazovanju, preiskovanju, raziskovanju in beleženju pokrajine; didaktični postopek, ki lahko poteka med običajnim poukom, na ekskurziji, šolski učni poti, poučnem sprehodu, naravoslovnem dnevu, šoli v naravi ali drugi dejavnosti, ki je vezana na predpisani šolski program« (Lipovšek, 2016, 9).

Do kurikularne prenove leta 1998 terensko delo v Sloveniji ni bilo umeščeno v kurikularne dokumente kot obvezna sestavina pouka. Lipovšek (2016) ugotavlja, da če je bilo izpeljano, je bilo v okviru ekskurzij, naravoslovnih dni, taborjenj v naravi, šole v naravi in podobno. Kljub temu so se slovenski geografi že pred umestitvijo v kurikularne dokumente tudi v šolah posvečali tej obliki dela, posledično pa so nastajali različni priročniki in publikacije za podporo izvajanju terenskega dela. Med njimi so bili prvi npr. Kert, Klemenčič, Kunaver, Pak (1981) z Geografija 3: geografske značilnosti in sodobni problemi Slovenije in Jugoslavije, Spoznavanje in proučevanje domače regije; Geografski obzornik 1989 – posebna številka revije za geografsko izobraževanje, posvečena raziskovalnim nalogam učencev oz. dijakov na terenu; Kunaver, Černe, Kert, Klemenčič, Lovrenčak, Pak, 1989, Domača pokrajina. Terensko delo kot dopolnitev pouku geografije pred uvedbo le tega v kurikularne dokumente, omenja še več drugih avtorjev v Sloveniji, npr. Zgonik (1995), ki ga poimenuje terensko raziskovalno delo in ga umešča med dodatno pedagoško-didaktično delo, vidi ga kot vir razvijanja ustvarjalnega mišljenja. Kot piše Brinovec (2004) je tudi Medved že v sedemdesetih letih poudarjal pomen terenskega dela za pridobivanje spoznanj z opazovanjem iz domačega okolja, ki je zanj vir geografskih spoznanj.

S kurikularno prenovo leta 1998 je bilo terensko delo v Sloveniji uradno umeščeno v kurikulum osnovne šole in srednjih šol. Postalo je obvezni sestavni del pouka na podlagi mnenja, da učenci pri terenskem delu razvijajo znanje, ki ga z drugimi izobraževalnimi metodami ne pridobijo (Polšak idr., 2008; Kolnik idr., 2011; v Lipovšek, 2016). V osnovni šoli je umeščeno v obvezni predmet geografija (Kolnik idr., 2011) ter v izbirni geografski predmet Raziskovanje domačega kraja in varstvo njegovega okolja (Kunaver, Bevc Malajner, Černe, Cunder, Senegačnik, Otič, Osterman, 2004). Pri slednjem je poudarek prav na terenskem raziskovanju naravnogeografskih značilnosti domačega kraja (geološka zgradba, relief, podnebje, prsti, rastlinstvo, vodovje), družbenogeografskih značilnosti domačega kraja (prebivalstvo, naselja, gospodarstvo, oskrba, promet), varstvu okolja (npr. preučevanje odlagališč odpadkov in ukrepov za varovanje okolja, preučevanje sprememb v pokrajini, nastalih pod vplivom človeka) ter varovanju naravne in kulturne dediščine domačega kraja. Izbirne vsebine tega predmeta so vezane tudi na pripravo na geografsko tekmovanje, ki poteka za osnovne in srednje šole pod okriljem Zavoda za šolstvo RS in vključuje tako teoretični del kot terensko delo. Terensko delo je umeščeno tudi v obvezni predmet geografija gimnaziji (Polšak idr., 2008). V letih po kurikularni prenovi (1998) je nadalje postalo terensko delo obvezno pri nacionalnih preizkusih znanja v osnovni šoli (Pravilnik o preverjanju in ocenjevanju znanja z nacionalnimi preizkusi znanja ob koncu obdobj v devetletni osnovni šoli, člen 31) in na gimnazijski maturi (Predmetni izpitni katalog). Iz opravljenega terenskega dela dijaki, ki izberejo na gimnazijski maturi geografijo kot izbirni predmet, pridobijo 20 % ocene predmeta. Ob preimenovanju nacionalnih preizkusov v nacionalno preverjanje znanja je bilo leta 2005 v osnovni šoli zunanje preverjanje terenskega dela odpravljeno (Pravilnik o nacionalnem preverjanju znanja v osnovni šoli, člen 11). Terensko delo je prav tako del Kataloga znanja za srednja strokovna izobraževanja in poklicno-tehniško izobraževanje (1998). Analiza učnih načrtov za osnovne šole in različne smeri srednjih šol pokaže, da so operativni cilji, neposredno vezani na

terensko delo, sicer redki in pretežno usmerjeni v fizično geografijo, a ob tem je potrebno dodati, da je zasnova splošnih in etapnih oz. usmerjevalnih ciljev tako široka, da omogoča vključevanje vsebinsko in metodološko raznolikega terenskega dela, prav tako je terenskemu delu posvečena posebna pozornost v okviru didaktičnih priporočil navedenih dokumentov. Ob neposrednem pouku geografije in ekskurzijah je prostor za realizacijo terenskega dela v šolah v Sloveniji tudi v okviru dni dejavnosti. Tako so v predmetnik osnovne šole letno vključeni štirje kulturni dnevi, trije naravoslovni in trije tehniški dnevi ter pet športnih dni (Predmetnik OŠ, sprejet na 23. seji SSSI, dne 17. 12. 1998 in usklajen s spremembami ZOŠ (2011, 2012), na 153. seji SSSI, dne 13. 12. 2012 ter usklajen s spremembami ZOŠ (2013), na 162. seji SSSI, dne 13. 2. 2014). Poleg tega šole izvajajo tedne šole v naravi v javnem zavodu Center šolskih in obšolskih dejavnosti (CŠOD), katerega osnovni namen je promocija šole v naravi, to je učenja v naravi oz. terenskega dela. Tako je v Sloveniji 26 domov CŠOD, ki izvajajo raznolike programe, znotraj katerih ima geografija pomembno mesto (CŠOD, 2024).

V zborniku Slovenska šolska geografija s pogledom v prihodnost, ki je eno ključnih del na področju t.i. šolske geografije, je slabih deset let po uvedbi terenskega dela v uradni kurikulum izpostavljal pomen terenskega dela Kunaver (2005), ki se je pri tem upiral na mednarodno listino o geografskem izobraževanju in posebej omenjal Haubricha, ki je slabosti pouka geografije videl v pomanjkanju terenskega dela in eksperimentiranja (2005, 90). Kolnikova (2006) je poudarjala pomen strokovnega razmisleka o didaktični vrednosti učenja geografije na prostem s tem, ko je izpostavljala, da je pomembno razmišljati o smislu, namenu in vrednosti terenskega dela, pa tudi o ključnih merilih za njegovo pripravo in vrednotenje ter o elementih za didaktično analizo sestavin izobraževalno-vzgojnega dela na prostem.

V nadaljevanju bomo izpostavili pristope slovenskih avtorjev k metodološkemu klasificiranju geografskega terenskega dela v kontekstu izobraževanja. Brinovec, Godnov, Lovrenčak (1997) so v 90. letih razvili pojmovanja metod terenskega dela pri pouku geografije. Terensko delo je razumel kot osnovno obliko geografskega pouka ter omenjal več njegovih prednosti, kot so večja učinkovitost dela, motiviranje in aktiviranje učečih in možnost diferenciacije učečih. Metode terenskega dela je klasificiral glede na prevladujoči postopek dela ter ločil: metode neposrednega opazovanja, metode risanja, metode merjenja, metode zbiranja vzorcev, metode intervjuvanja in anketiranja ter metode zbiranja podatkov in kartiranja. Metodo opazovanja je razumel kot temeljno geografsko metodo, ki jo je potrebno priučiti postopoma, izvajamo jo samostojno ali povezujemo z drugimi metodami (npr. risanje, zbiranje vzorcev, anketiranje, itd.) ter učnimi oblikami (npr. delo v dvojicah, skupini, itd.). Metode risanja je razumel kot risanje krokija, skice ali panoramske risbe, pri čemer je poudarjal, da je pomembno sistematično uvajanje učečih. Metode merjenja po Brinovcu predstavljajo most med teorijo in prakso. Učeči se v tej povezavi naučijo rokovanja z instrumenti za merjenje in interpretacije rezultatov. Pri metodi zbiranja vzorcev Brinovec sicer izpostavlja zbiranje kamnin, vendar je v geografiji koristno tudi zbiranje vzorcev drugih naravnih elementov, nenazadnje pa tudi družbenih prvin (časopisni izrezki, razglednice...). Zbirke le teh omogočajo lažji stik z realnostjo že v šoli oz. lažji prenos in uporabo znanja v realnem okolju. Brinovec nadalje izpostavlja metodi intervjuvanja in anketiranja, ki sta pomembni zlasti v okviru družbene geografije, a ju lahko vežemo tudi na fizičnogeografske ali kompleksne okoljske tematike. Kot metodo zbiranja podatkov je Brinovec razumel zlasti samostojno pridobivanje podatkov (brez merilnih instrumentov), npr. štetje določenih elementov (npr. število obiskovalcev, avtomobilov, itd.). Metodo kartiranja je Brinovec razumel kot

evidentiranje in prostorsko prikazovanje geografskih pojavov na zemljevidih. (Brinovec, idr. 1997).

Na podlagi Brinovčeve klasifikacije se je postopoma izoblikovala zbirka konkretnih delovnih postopkov oz. metod, zlasti fizičnogeografskega izobraževalnega terenskega dela, ki se v več slovenskih raziskovalnih delih pojavljajo kot primeri dela z učenci, dijaki, drugimi obiskovalci na učnih poteh ali v učilnicah v naravi (npr. Troha, 2022; Regoršek, 2022; Simonič, 2021; Radinovič, 2020; Ajlec, 2020; Jus, 2019; Bezgovšek, 2019; Mirnik, 2019 in drugi). Intenzivno je v obdobju od 2005 do 2020 na področju zbiranja, razvijanja ter opisovanja metod (izobraževalnega in raziskovalnega) terenskega dela delala Vovk Koržetova s sodelavci, ki je postopke terenskega dela vezala zlasti na prsti, vodovje in rastlinstvo ter ekoremediacije (npr. Vovk Korže, 2007).

Ob Brinovcu je o pristopanju k terenskemu delu za namene izobraževanja pisal tudi Lipovšek (2016). Le ta gleda na terensko delo iz učiteljskega praktičnega vidika, ko sklene, da lahko terensko delo pri pouku geografije uporabimo kot:

- sredstvo (v tem primeru učeči po navodilih učitelja na terenu zgolj izvršujejo zadane naloge, npr. zbirajo vzorce, preštevajo določene elemente pokrajine, si zabeležijo informacije ali si jih zapomnijo, ob povratku v razred pa sledi analiza pridobljenega, tudi zaključno poročilo, plakat ipd.);
- obliko pouka (v tem primeru učitelj prenese celovite učne dejavnosti iz učilnice v pokrajino, pri čemer je posebej pomembna predpriprava učečih, saj s tem postavljamo osnovo tudi za njihovo prihodnje delo na prostem (npr. kako naj se pripravijo, kakšne pripomočke naj vzamejo s sabo, kakšne nepredvidljivosti jih lahko čakajo, koliko časa porabijo za takšno dejavnost, itd.));
- spoznavno metodo (vključuje celovit raziskovalni postopek učencev: ugotovitev in opredelitev problema, oblikovanje domnev in možne rešitve, izločitev relevantnih informacij, zbiranje informacij, shranjevanje in arhiviranje gradiv, analiza podatkov, razmislek o rezultatih, potrditvev ali zavrnitev domnev in oblikovanje novih domnev in novega raziskovalnega kroga).

Lipovšek tudi predlaga terenske naloge glede na njihov namen v uradnem kurikulumu, aktualno pedagoško filozofijo, vodilne pripomočke ali metode pri terenskem delu, pri čemer izhaja iz splošnih izobraževalnih smernic ter iz potreb geografije kot znanosti oz. šolskega predmeta. Izpostavlja:

- regionalno usmerjene terenske naloge (teren, vezan na proučevanje celovitega regionalnega okolja),
- kartiranje in anketiranje (poudarja geografski veščini, ki sta predpisani v učnem načrtu za osnovne in srednje šole in lahko potekata v prostoročni ali računalniški obliki),
- računalniško podprte terenske naloge (s katerimi poudarja aktualne vidike digitalne pismenosti),
- samopreverjevalno usmerjene terenske naloge (odgovornost za rezultate prevzame učeči),
- virtualno terensko delo (motivacijsko sredstvo, vir informacij za pouk in sredstvo za usvajanje novega znanja, pri čemer učeči za doseg ciljev uporablja informacijske tehnologije).

3.3 Terensko delo v terciarnem geografskem izobraževanju kot temelj učiteljske prakse

Temelj izobraževalnega sistema so učitelji, ena od podlag njihovega profesionalnega razvoja, ki ima posebno visok vpliv na njihovo poklicno delovanje, pa je študij na univerzi. Ker smo menili, da sta pogostnost in način vključevanje terenskega dela v realni izvedbeni kurikulum v veliki meri odvisna od učiteljeve motiviranosti za to, nas je zanimalo, kako je terensko delo umeščeno v predmetnike geografskega študija. Nenazadnje tudi na terciarni stopnji izobraževanja velja, da je terensko delo najbolj prvinski, celosten in učinkovit način spoznavanja ter raziskovanja pokrajine oz. geografskega prostora.

V Sloveniji študij geografije v okviru terciarnega izobraževanja poteka na treh univerzah: Univerzi v Ljubljani (Filozofska fakulteta, Oddelek za geografijo), Univerzi na Primorskem (Fakulteta za humanistične študije, Oddelek za geografijo) in na Univerzi v Mariboru (Filozofska fakulteta, Oddelek za geografijo). Na vseh treh oddelkih poteka študijski program na dveh stopnjah: prvi stopnji, ki traja tri leta in ki predstavlja splošen program študija geografije sledi druga stopnja, ki traja dve leti in na kateri se študenti razdelijo na pedagoški in nepedagoški/e program/e oz. smeri. V našem primeru smo analizirali celotno vertikalno pedagoških študijskih programov, ki so na vseh treh oddelkih dvopredmetni. Podatke o zastopanosti terenskega dela smo leta 2020 povzeli po predmetnikih, ki so bili objavljeni na spletnih straneh vseh treh oddelkov. V naši analizi navajamo strukturo zastopanosti terenskega dela v celoti, po stopnjah in po letnikih.

Na Oddelku za geografijo Filozofske fakultete Univerze v Ljubljani se na prvi in drugi stopnji študij izvaja v okviru 79 učnih enot: v 46 na 1. stopnji in v 33 na 2. stopnji. Od tega je 11 izbirnih učnih enot na 1. stopnji in 10 izbirnih učnih enot na 2. stopnji. Terensko delo se izvaja pri 18 učnih enotah na prvi stopnji in pri 12 učnih enotah na 2. stopnji (pedagoška smer). Na 1. stopnji terensko delo skupaj obsega 190 ur, kar znaša 7,7 % vseh ur. Pri tem 40 ur odpade na 1. letnik (v tem letniku terensko delo predstavlja 6,2 % vseh ur), 125 ur na 2. letnik (17,4 %) in 25 ur na 3. letnik (3,9 %). Terensko delo je pri predmetih obsegalo večinoma med 5 in 15 ur, le pri predmetu Geografsko terensko delo je število ur 75 (100 %). Na 2. stopnji – pedagoška smer se je terensko delo odvijalo v skupaj 30 urah. Vse ure terenskega dela na 2. stopnji so se izvajale pri predmetu Organizacija ter izvedba ekskurzije in terenskega dela v 1. letniku. Terensko delo v celotni vertikali, ki ji sledijo študenti pedagoške smeri, je znašalo 220 ur ali 5,8 % od vseh ur.

Na Oddelku za geografijo Fakultete za humanistične študije na Univerzi na Primorskem se je na prvi in drugi stopnji študij izvajal v okviru 40 učnih enot (24 na prvi in 16 na drugi stopnji). Od tega je bilo izbirnih učnih enot skupaj 13 (10 na prvi in 3 na drugi stopnji). Iz predmetnika je bilo mogoče razbrati, da se je na prvi stopnji terensko delo izvajalo le pri izbirnih predmetih (Biogeografija, Terenski seminar Istra, Terenski seminar Zahodna in Srednja Evropa, Terenski seminar Jugovzhodna Evropa, Terenski seminar Slovenija z zamejstvom) in sicer 30 ur pri vsakem predmetu. Na drugi stopnji iz predmetnika ni bila eksplicitno razvidna količina terenskega dela. V celotni vertikali je bilo v učnih enotah skupaj 150 ur terenskega dela, kar predstavlja 6,3 % vseh pedagoških obveznosti (preračunamo le na 1. stopnjo, znaša ta delež 10,4 %). Pri vseh štirih terenskih seminarjih je terensko delo predstavljalo 67 % vseh pedagoških obveznosti znotraj teh učnih enot, pri predmetu Biogeografija pa 40 %.

Na Oddelku za geografijo Filozofske fakultete Univerze v Mariboru je potekal študij na dvopredmetnem programu na prvi stopnji v okviru 19 obveznih učnih enot in devetih izbirnih učnih enot, izmed katerih študenti izberejo pet učnih enot. Na drugi stopnji je potekal dvopredmetni pedagoški študij v okviru 16 obveznih učnih enot in 20 izbirnih učnih enot, izmed katerih študenti izberejo tri. V analizo smo tako zajeli skupaj 74 učnih enot (28 na 1. stopnji in 46 na 2. stopnji). Na 1. stopnji se je terensko delo pojavljalo pri 13 obveznih in 9 izbirnih učnih enotah, skupaj torej pri 22 učnih enotah (79 % vseh učnih enot). Na 1. stopnji se je med skupaj 1065 urami terensko delo pojavljalo v višini 135 ur (12,7 %), medtem ko je bilo na 2. stopnji med skupaj 1167 urami terensko delo zastopano s 177 urami (15,2 %). Pri predmetih obeh stopenj je bilo terensko delo zastopano s 14,0 %. V 1. letniku 1. stopnje je bilo med obveznimi predmeti 8,2 % terenskih ur, v 2. letniku 5,7 %, v 3. letniku pa 14,0 %. Med izbirnimi predmeti vseh treh letnikov je bil ta delež 22,2 %. Vsebine terenskega dela pri posameznih predmetih na 1. stopnji so bile najpogosteje povezane z usvajanjem metodologije raziskovanja v pokrajini na področju fizične in družbene geografije. Študenti so raziskave v okviru posameznih predmetov izvajali na območju Slovenije, rezultati pa so bili pogosto prikazani v obliki posterjev ali člankov. Na 2. stopnji se je terensko delo izvajalo pri 4 obveznih učnih enotah in pri 8 izbirnih učnih enotah, skupaj torej pri 12 učnih enotah (26 % vseh učnih enot). Ta delež je bil na 2. stopnji pričakovano nižji zaradi narave usmeritve študija: v predmetniku se namreč ne pojavljajo le učne enote, ki so vsebinsko vezane na geografijo, pač pa tudi tiste, ki so v povezavi s pedagogiko, didaktiko in psihologijo. V 1. letniku 2. stopnje je znašal delež terenskega dela 14,3 %, v 2. letniku pa 8,2 %, medtem ko je bil pri izbirnih predmetih ta delež 17,9 %. Med predmeti na 1. stopnji je bilo največje število ur terenskega dela pri obveznem predmetu Regionalna geografija Evrope (15) in pri izbirnem predmetu Turistične regije v Evropi (15), medtem ko je bilo pri večini ostalih predmetov le po 5 ur terenskega dela. Na 2. stopnji so bili med predmeti, ki so izstopali po številu ur terenskega dela obvezni Interdisciplinarna opazovalna praksa (30 ur), Pedagoški praktikum Geografija 1 in 2 (vsak po 16 ur) ter izbirni predmeti Šola v naravi (15 ur), Terensko delo pri pouku geografije – fizična geografija (10 ur) in Terensko delo pri pouku geografije – družbena geografija (10 ur). V celotni vertikali je bilo v učnih enotah skupaj 312 ur terenskega dela, kar predstavlja 14,0 % vseh pedagoških obveznosti (na 1. stopnji 12,7 %, na 2. stopnji 15,2 %). Študenti na obeh stopnjah so fakultativno sodelovali tudi na geografskih raziskovalnih taborih, ki so se odvijali na območju severovzhodne Slovenije. Drugi fakultativni način uvajanja študentov v terensko delo so tudi raziskovalni projekti, ki jih financira Štipendijski sklad RS.

Po formalnem pregledu zastopanosti terenskega dela v predmetniku lahko ugotovimo, da je praktičnega terenskega dela, v okviru katerega bi študenti geografije na najbolj prvinski način prišli v stik s svojim predmetom proučevanja (pokrajino) relativno malo. Manj terenskega dela pomeni tudi slabše možnosti za neposredno seznanjanje in usvajanje metod terenskega raziskovanja.

3.3 Terensko delo v realnem izvedbenem kurikulumu primarne in sekundarne stopnje geografskega izobraževanja

Kljub temu, da dokumentarne podlage pouka geografije v Sloveniji podpirajo in spodbujajo terensko delo v osnovni in srednjih šolah, študenti geografije pa imajo terensko delo tudi v študijskih predmetnikih, smo želeli pridobiti vpogled še v realni kurikulum osnovnih in srednjih šol, torej v to, koliko se terensko delo v šolah dejansko izvaja ter kakšna stališča imajo učitelji geografije o njem. V ta namen smo opravili

odprto raziskavo med desetimi učitelji geografije v osnovni in desetimi učitelji geografije v srednji šoli. Odprti značaj pridobivanja podatkov je pogojeval manjši vzorec učiteljev, saj so le ti morali samostojno in obsežno odgovoriti na več vprašanj in sicer o tem, koliko so bili s terenskim delom seznanjeni pri študiju, koliko ga realizirajo, kakšne prednosti, pomanjkljivosti in ovire vidijo pri realizaciji le tega, v koliki meri ga realizirajo v sodelovanju z učitelji drugih predmetov ter pri katerih vsebinah, v koliki meri ga realizirajo v sodelovanju z zunanjimi institucijami ter pri katerih vsebinah. Ob tem pa smo želeli pridobiti tudi vpogled v dejanske vsebine, metode in časovne umestitve terenskega dela pri vključenem vzorcu učiteljev geografije.

Povprečna starost anketirancev je bila 44, 5 let, povprečna dolžina delovnih izkušenj pa 17, 6 let. Med anketiranimi učitelji jih je 20% končalo višješolski študij, 80% pa visokošolski pedagoški študij. 60% je bilo žensk in 40% moških. 20% anketirancev je poučevalo zgolj geografijo, preostali pa so geografijo kombinirali še vsaj z enim šolskim predmetom (največkrat z zgodovino, sledijo pedagogika, sociologija, nemščina in angleščina). Povprečno so imeli 20 ur pouka tedensko. 30% anketiranih je poleg obveznega pouka geografije izvajalo še geografski krožek, ali dodatne ure geografije za nadarjene, ali geografski izbirni predmet Raziskovanje domačega kraja in varstvo njegovega okolja oz. izbirni predmet Turistična vzgoja.

60% anketiranih osnovnošolskih učiteljev geografije je zatrnilo, da so bili v okviru študija geografije dovolj seznanjeni s terenskim delom. Ko so navedeno vrednotili z ocenami od 1 do 5, pri čemer je pet pomenila najvišjo stopnjo seznanjenosti, so v povprečju izbrali oceno 4. Tudi na primeru srednješolskih učiteljev se je pokazalo, da jih enak delež meni, da so bili v času študija dovolj dobro seznanjeni s terenskim delom, vendar je ocena tega zadovoljstva nižja kot na primeru osnovne šole (3,6). Učitelji so navedli, da so se s terenskim delom najbolje seznanili pri študijskih predmetih družbene ali fizične geografije oz. pri terenskih ekskurzijah regionalne geografije, med temi jih je povprečno 15% navedlo tudi predmete, vezane na didaktiko geografije, na pedagoško prakso v šolah oz. z obojim povezane dejavnosti (npr. sodelovanje pri geografskem šolskem ali mednarodnem tekmovanju v okviru študija). Na obeh izobraževalnih nivojih je 90% anketiranih zatrnilo, da izvajajo terensko delo, po eden od anketiranih pa le tega nikoli ni izvajal terenskega dela, čeprav bi to želel. Povprečno 60% anketiranih je izvajalo terensko delo zgolj občasno. Pri izvajanju terenskega dela so anketirani osnovnošolski učitelji zaznavali različne prednosti in sicer so bile med najvišje ovrednoteni:

- da terensko delo povezuje učenje v učilnici z dejanskim življenjem, da gre za razvijanje praktičnih uporabnih znanj;
- da omogoča pristno spoznavanje naravne in kulturne dediščine, pristen stik s pokrajino, delo v pokrajini oz. neposredno opazovanje;
- da omogoča konkretno fizično in miselno aktivnost učencev ter rokovanje z različnimi pripomočki;
- da je za učence motivirajoče in vpliva na njihovo sproščenost, saj ura izven šole ni toliko omejujoča.

Poleg navedenih omenjajo še prednosti, da se s terenskim delom dobro poglobijo obstoječa znanja, izboljšajo prostorske predstave, vključujoč različne "merske" predstave, in orientacija, da se krepí okoljska in narodna zavest, da prihaja pri terenskem delu do boljšega medpredmetnega povezovanja pa tudi, da je možno uspešneje vključiti učno šibkejše učence in nenazadnje, da je na terenu pridobljeno znanje trajnejše.

Anketirani srednješolski učitelji so navedli podobno raznolike prednosti terenskega dela, ki so jih tudi večinoma vrednotili z najvišjo oceno:

- terensko delo je aplikacija geografske teorije v prakso, omogoča razvoj sposobnosti opazovanja pokrajine in podkrepitev teoretičnih znanj z izkustvenim učenjem (npr. govorimo o podnebnih elementih, potem pa jih dijaki sami izmerijo, vrednosti primerjajo, analizirajo);
- šele pri terenskem delu dijaki v veliki meri spoznajo smisel naučenega znanja; bolje poznajo in razumejo procese v naravi; prav tako sami spoznajo, v čem jim še znanja manjka, ter so si manjkajoče voljni sami tudi poiskati;
- motiviranost, večja aktivnost in sprostitvev dijakov;
- razvijanje orientacije v prostoru;
- razvijanje doumevanja pomena ohranjanja biodiverzitete, čistosti voda oz. varstva okolja;
- prepoznavanje prilagoditev gospodarskih dejavnosti sonaravnim načelom.

Ob navedenih prednostih z najvišjim pomenom so anketirani srednješolski učitelji omenjali še razvijanje analitičnega mišljenja in različnih kompetenc (metodoloških, socialnih, IKT), krepitev samozavesti dijakov skozi individualno in timsko delo, lažje doseganje nekaterih ciljev in povezovanje vsebin in predmetov.

Med pomanjkljivostmi terenskega dela so anketirani osnovnošolski učitelji najpogosteje navedli:

- problem števila učencev v razredu oz. s tem povezane administrativne zahteve – po veljavnem normativu morajo namreč imeti pri izhodu iz šole skupine, večje od 15 učencev, dodatnega učitelja spremljevalca;
- pomanjkanje časa, ki ga terensko delo zahteva več (od priprave do izvedbe in analize), pri čemer pa je po njihovem mnenju učni načrt že preobtežen z vsebino in je potrebno "hiteti z obravnavo snovi";
- pomanjkanje ustreznih pripomočkov;
- odvisnost od vremenskih pogojev;
- nezainteresiranost (nekaterih) učencev;
- težavno vključevanje učencev s posebnimi potrebami.

Zgolj v enem primeru je bil izpostavljen problem lokacije šole in sicer na primeru tipično mestne šole, kjer je potrebno pol ure hoje do prvega potoka. Posamezniki so (a z nizkimi ocenami pomembnosti) kot pomanjkljivost navedli še problematiko razumevanja nadrejenih za organizacijo terenskega dela ter lastno usposobljenost.

Anketirani srednješolski učitelji so med pomanjkljivosti terenskega dela (podobno kot osnovnošolski) našli:

- pomanjkanje časa v smislu časovne potratnosti celovite izvedbe (še posebej v povezavi s količino vsebine v učnem načrtu);
- potrebo po delitvi dijakov v skupine, po prilagajanju urnika in tedenskih obremenitev dijakov;
- pogosto nerazumevanje v kolektivu, kar je povezano z zakonsko določenim spremstvom dijakov, kar zelo ovira izvedbo terenskega dela;
- pomanjkljiva motivacija dijakov na terenu oz. težje ohranjanje discipline, če koga delo ne zanima;
- problem pomanjkanja opreme oz. terenskih pripomočkov;
- finančne težave (nabava pripomočkov, delitev ur, prevoz).

Ob naštetem je bil v enem primeru omenjen občutek, da se terensko delo (objektivno oz. od zunaj) ne upošteva kot enakovredno ostalemu delu v učilnici oz. da se smatra

kot manj pomembno (interne ocene na maturi, ki se pridobijo s terenskim delom, so namreč navadno visoke zaradi zavzetosti dijakov, kar naj bi vnašalo neodobravanje in nerazumevanje v kolektivu učiteljev).

Najvišje ocenjena in najpogosteje navedena ovira za izvajanje terenskega dela v izobraževalnem procesu je bila po mnenju anketirancev birokratske narave (zagotavljanje varstva oziroma varnosti učencev, kar terja pripravo varnostnega načrta in zagotavljanje spremljevalcev, čemur sledi nadomeščanje sodelujočih učiteljev pri njihovih lastnih urah ipd.).

Pri anketiranju učiteljev geografije se je tudi realno pokazal potencial terenskega dela, ki se kaže v možnosti medpredmetnega povezovanja oz. holističnega spoznavnega pristopanja v realnem življenjskem okolju. Kar 90% anketiranih osnovnošolskih učiteljev je izvajalo terensko delo v medpredmetnem sodelovanju z drugimi učitelji. Navedli so širok spekter predmetov: 50% biologijo oz. naravoslovje (najpogostejše vsebine povezovanja so vezane na rastlinstvo: sadjarstvo, hmeljarstvo, drevesne vrste, gozd), 40% zgodovino (gospodarske panoge skozi čas, arhitektura v mestu, turistične znamenitosti, pomembna kulturna dediščina), 30% fiziko (viri energije, nastanek padavin, naklon, zračni tlak) in slovenščino (kulturna dediščina, verzi, pregovori, zemljepisna imena), 20% kemijo (kamnine v Sloveniji, vodovje: kvaliteta vode, uporaba kemijskih pripomočkov), tehniko in tehnologijo (risanje tlorisa in drugih načrtov, izdelava terenskih pripomočkov), matematiko (merjenje, obdelava podatkov), šport (gibanje v naravi) in likovno umetnost (risanje panoramske risbe), navedli pa so tudi tuje jezike (verzi, pregovori) in računalništvo (obdelava podatkov). 70% sodelujočih osnovnošolskih učiteljev je izvajalo terensko delo tudi v sodelovanju z zunanjimi institucijami, pri čemer so navedli sledeče primere: hidroelektrarne, Kmetijski inštitut Slovenije, turistično informacijski centri, društva in turistične agencije, Luka Koper, muzeji – npr. Ekomuzej, muzej kovaštva v Kropi, muzej Postojnske jame, centri eksperimentov v Mariboru in Ljubljani, Agencija RS za okolje, knjižnice, statistični urad, rojstne hiše pomembnih Slovencev. Med srednješolskimi anketiranimi učitelji geografije jih je potrdilo medpredmetno povezovanje pri realnih izvedbah terenskega dela manj kot na primeru osnovne šole, a še vedno več kot polovica (60%) (navedli so naravoslovna področja, zlasti biologijo ter zgodovino in slovenščino, pa tudi gradbeništvo, turizem in ekologijo). Z izjemo dveh anketirancev se srednješolski učitelji pri izvedbi terenskega dela ne povezujejo z zunanjimi institucijami, kar je bistveno manj kot v osnovni šoli. Med omembami sodelujočih institucij so bile omenjene zlasti te, ki ponujajo namestitve – kmečki turizem, hoteli, kočice ter centri šolskih in občinskih dejavnosti (CŠOD). Eden od srednješolskih anketiranih učiteljev je bil mnenja, da bi bilo odlično, če bi imeli v Sloveniji možnost ureditve geografskega poligona, ki bi združeval: kamninsko sestavo domačega okolja, širšega okolja vezanega na Slovenijo in posebnosti iz sveta; pedološke profile domačega okolja, širšega okolja, vezanega na Slovenijo in posebnosti iz sveta; rastlinske združbe domačega okolja, širšega okolja vezanega na Slovenijo in posebnosti iz sveta ter klimatsko opazovalnico. Tak poligon bi zelo olajšal izvedbo terenskega dela za šole. V Sloveniji sicer obstaja geografski učni poligon v kraju Dole pri Poljčanah, kjer je poudarek na aplikaciji geografskih znanj za ekosistemsko urejanje zemljišča v obsegu 1 ha z namenom rastlinske samooskrbe. Poligon sprejema učne skupine različnih starosti, od najmlajših do starostnikov (Učni poligon Dole, 2020).

Ko smo sodelujoče osnovnošolske učitelje zaprosili za to, da opišejo konkretne primere terenskih del, smo ugotovili, da je v osnovni šoli terensko delo najbolj

zastopano v šestem in v devetem razredu. V šestem razredu so med najpogosteje omenjenimi vsebinami: orientacija s kompasom, orientacija z zemljevidom, merjenje in preračunavanje razdalj, opisovanje lege različnih točk; opazovanje reliefa in ugotavljanje nadmorske višine, risanje risb terena in panoramskih risb. Posamično je bilo navedeno še kartiranje in določanje rastlinskih vrst. Med lokacijami terenskih del šestega razreda so bile omenjene: šolsko dvorišče, urbana okolica šole, bližnji mestni parki in gozdovi ter ekskurzije v različne dele Slovenije (itinerarij šolskih ekskurzij je vezan na letni načrt šole in variira od šole do šole). Terensko delo večinoma traja od dveh do petih šolskih ur oz. več, če gre za organizacijo terenskega dela v okviru ekskurzij ali dni dejavnosti (naravoslovni, športni, tehniški, kulturni dnevi). V sedmem razredu se pri terenskem delu ohranjajo podobne vsebine kot v šestem, a se jim priključijo še opazovanje in merjenje vremenskih/podnebnih elementov, analiza prsti ter anketiranje. Podobno kot za sedmi, velja tudi za osmi razred. Dodatno omenjena vsebina je bila vodovje. Ker gre v osmem razredu po učnem načrtu za obravnavo Sveta, je bila zanimiva predstavitev krajše individualne terenske vaje, kjer učenci preverjajo izvor izdelkov, ki jih kupujejo v domačem gospodinjstvu s poudarkom na ugotavljanju, ali kupujejo izdelke s palmovim oljem, kar navežejo na problematiko krčenja tropskih gozdov, nakar v bližnjih trgovinah iščejo alternativne izdelke, ki ne vsebujejo palmovega olja. V devetem razredu je bil razpon vsebin in ciljev terenskega dela najobsežnejši. Ob vsebinah, ki so se pojavljale tudi v prejšnjih razredih osnovne šole, smo tako zasledili še iskanje, prepoznavanje, primerjanje, analiziranje vzorcev kamnin; kemijske in fizikalne analize vode, opazovanje in skiciranje rečnih reliefnih oblik; štetje prometa; kartiranje turistične ponudbe, namembnosti stavb in podobno. Pri pregledu opisov konkretnih primerov terenskih del v srednješolskem izobraževanju smo zaznali, da je terensko delo najbolj zastopano v prvem, še zlasti pa v četrtem letniku v gimnazijskem programu, ki je vezan na maturo ter na pridobitev 20% deleža interne izpitne ocene skozi terensko delo. V prvem letniku so bile najpogosteje omenjene vsebine: kopanje in analiza profila prsti ter določanje lastnosti le teh, pri čemer je nabor metod in preciznost izvedbe višja kot na primeru osnovne šole (npr.: barva, struktura, tekstura, reakcija, vlaga); merjenje in analiza fizikalnih (najpogosteje globina, širina, hitrost, pretok...) in kemijskih lastnosti voda ter merjenje in primerjanje klimatskih/vremenskih elementov. Najpogostejše lokacije so terenskega dela so bile v bližini šole ali v domačem okolju dijakov. V drugem letniku so bile omenjene podobne vsebine kot v prvem letniku, a je bilo zaznati, da se v nekaterih primerih zaobjame vsebina bolj kompleksno kot v prvem letniku (npr. se izvede celovita naravnogeografska in družbenogeografska študija vodotoka in območja ob njem, vključujoč ugotavljanje rastlinskega in živalskega sveta, gospodarskih dejavnosti ob vodotoku ter njihovega vpliva na stanje vode, ugotavljanje izkoriščenosti vodotoka in njegovega potenciala, mikroreliefne oblike ob vodotoku, anketiranje prebivalstva o njegovem odnosu do vodotoka, ugotavljanje zemljepisnih imen, povezanih z vodotokom ipd.) V tretjem letniku smo zaznali poleg že navedenega še kompleksnejše analize vegetacije, vključujoč popisovanje in določanje rastlinskih vrst na manjšem območju gozda ali roba gozda, ugotavljanje vpliva prsti, podnebja, reliefa, vodovja ter človeka na razširjenost vegetacije, ekološke značilnosti območja, izdelovanje mini herbarija. Zanimiv je bil tudi opis politično-geografske terenske vaje, povezane z državljansko vzgojo, ki vključuje spoznavanje slovenske prestolnice ter državnih in evropskih institucij v njej ter pogovore s poslanci. Posamezno terensko delo je trajalo od dveh do štirih ur oz. več v okviru celodnevne ekskurzije ali celo več dni v okviru t. i. raziskovalnega tabora, ki se lahko izvede v okviru gimnazijskih izbirnih vsebin. V maturitetnem letniku je vsebinska gostota terenskih del največja: orientacija in preračunavanje razdalj, proučevanje kamninske podlage in površja, risanje reliefnega profila, ugotavljanje

lastnosti prsti, merjenje klimatskih elementov, proučevanje vodovja, proučevanje rastlinstva, štetje prometa in izdelovanje kart obremenjenosti križišč, raziskovanje turizma, izdelovanje turističnih prospektov, spoznavanje mestnega jedra s pomočjo aplikacije... Uporabljajo se terenski kovčki, različne merilne naprave, kompasi in zemljevidi, mobilni telefoni in pripadajoče aplikacije. Terenska dela so pogosto izvedena v bližini šole, občasno pa tudi v okviru ekskurzij in večdnevniških skupinskih taborov.

4 Sklep

Terensko delo kot oblika geografskega izobraževanja nedvomno sovпада z najpomembnejšimi in aktualnimi izobraževalnimi konteksti, ki podpirajo avtentično izkustvo in aktivno angažiranost učečih, njihovo veččutno in holistično učenje. S to obliko dela ima geografija visoko konkurenčno vrednost v izobraževalnem sistemu, obenem pa izkazuje svojo interdisciplinarno naravo, tudi skozi možnosti realiziranja in promoviranja medpredmetnega sodelovanja. Terenske metode in vsebine odgovarjajo na sodobne potrebe posameznika in skupnosti ter podpirajo trajnostno delovanje v prostoru. Z vsem navedenim je terensko delo vse pomembnejši element izobraževanja.

Terensko delo je bilo v slovenski geografiji vedno pomemben način spoznavanja in raziskovanja pokrajine, kar se je odražalo tudi v izobraževalnem sistemu. Kljub temu je bilo uradno umeščeno v kurikularne dokumente šele leta 1998. Analiza sedaj veljavnih učnih načrtov za osnovne šole in različne smeri srednjih šol pokaže, da je zasnova splošnih in etapnih oz. usmerjevalnih ciljev tako široka, da omogoča vključevanje vsebinsko in metodološko raznolikega terenskega dela in ekskurzij. Slednje je neposredno opredeljeno in sugerirano v vseh učnih načrtih, kar je učiteljem pomembna podlaga za realizacijo pouka izven šole. Ob neposrednem pouku geografije in ekskurzijah je prostor za realizacijo terenskega dela v šolah v Sloveniji tudi v okviru dni dejavnosti, saj so npr. v predmetnik osnovne šole letno vključeni štirje kulturni dnevi, trije naravoslovni in trije tehniški dnevi ter pet športnih dni (Predmetnik OŠ). Poleg tega oz. kot realizacijo dni dejavnosti osnovne šole izvajajo še tedne šole v naravi v javnem zavodu Center šolskih in obšolskih dejavnosti (CŠOD), katerega osnovni namen je prav promocija učenja v naravi (CŠOD, 2024). V gimnazijskem izobraževanju je pomembna spodbuda terenskemu delu maturitetni izpit, saj vključuje 20% interne izpitne ocene, ki se pridobi s terenskimi vajami. Evidenten vpliv na izvajanje geografskega terenskega dela imajo tudi geografska tekmovanja za učence in dijake, ki so sestavljena iz teoretičnega in terenskega dela. Pri tem je potrebno dodati, da so maturitetnega terenskega dela deležni le dijaki, ki izberejo geografijo kot predmet na maturi, geografska tekmovanja pa dosežejo samo tiste učence oz. dijake, ki se jih udeležijo na podlagi svojega interesa in mentorjeve angažiranosti.

Izjemno pomembno vlogo pri ustvarjanju podlag za terensko delo v šolah ima terciarno izobraževanje, cilji in vsebine študijskih programov, ki izobražujejo bodoče učitelje geografije. Slednji ter izvedbene izkušnje terenskega dela, ki jih učitelji pridobijo v procesu lastnega izobraževanja, so osnova za njihovo kasnejše delo v praksi. 60% anketiranih slovenskih učiteljev geografije je bilo mnenja, da so bili v okviru izobraževanja na univerzi dovolj seznanjeni s terenskim delom. Nedvomno zaznavajo raznolike prednosti in pozitivne učinke terenskega dela. Najpogosteje izpostavijo, da terensko delo omogoča povezovanje »teorije s prakso« skozi pristen stik s pokrajino, da povečuje zaznavanje uporabne vrednosti znanj, jih pogloblja in

osmišlja. Omogoča fizično in umsko aktivnost ter razvoj več kompetenc (od orientacije v prostoru do socialnih kompetenc in ravnanja z različnimi pripomočki). Ob tem pozitivno deluje na motiviranost učencev in dijakov.

Žal se pri organizaciji in izpeljavi terenskega dela učitelji geografije srečujejo tudi z več ovirami, zaradi česar je v slovenskih šolah manj terenskega dela, kot bi ga lahko bilo. Tudi Podobnik (2011, v Lipovšek 2016) navaja, zakaj se učitelji izogibajo terenskega dela:

- počutijo se negotovi, misleč, da so premalo usposobljeni za pripravo in izvedbo terenskega dela;
- dvomijo v učinkovitost terenskega dela;
- sprašujejo se o racionalnosti terenskega dela, za katerega se porabi veliko časa in materialnih sredstev;
- so v dilemi, katere vrste nalog pri terenskem delu najboljše podpirajo oz. uresničujejo učni načrt;
- imajo občutek, da se ne uspejo dovolj navezati na vsebino in znanje drugih predmetov;
- sprašujejo se kako s terenskim delom razvijati splošno, trajno, prenosljivo vseživljenjsko znanje;
- nimajo izdelanih ocenjevalnih meril;
- nimajo dovolj uporabnih strokovnih gradiv za pripravo terenskega dela.
- V naši raziskavi so se na obeh nivojih izobraževanja pokazale tri ključne objektivne ovire za izvajanje terenskega dela in sicer:
- administrativne ovire (zaradi normativa izvedbe pouka izven šole je pri večjih skupinah potrebno dodatno spremstvo pa tudi priprava varnostnega načrta, izvedbene prilagoditve v kolektivu);
- časovna potratnost (ki je povezana tako s potrebo po realizaciji obsežnega učnega načrta, s samo naravo terenskega dela, kot z logistiko izvedbe, saj je potrebna organizacija urnika, spremljevalcev na teren in nadomeščanja njihovih ur ipd.);
- finančne ovire (prevozi, nabava ustreznih terenskih pripomočkov).

Ne glede na to so krajše oblike geografskega terenskega dela v slovenskih šolah prisotne, a bi lahko bile pogostejše. V gimnazijah jih spodbuja zlasti maturitetni izpit. Realnost so tudi vsakoletne osnovnošolske interdisciplinarne ekskurzije v različne slovenske pokrajine, ki jih je praviloma v srednjih šolah manj, a se tam organizirajo tudi izven meja države. Vsebina terenskih vaj in metodološki pristopi si zaradi pomembnih razlogov, opisanih v prispevku, zaslužijo posebno pozornost in spodbudo na sistemskem področju, raziskovalnem in didaktičnem področju.

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Summary

Fieldwork as a form of geographic education undoubtedly coincides with the most important and current educational contexts that support the authentic experience and active engagement of learners, their multisensory and holistic learning. With this form of work, geography has a high competitive value in the educational system, and at the same time demonstrates its interdisciplinary nature, also through the possibilities of realizing and promoting interdisciplinary cooperation. Field methods and content respond to the modern needs of individuals and communities and support sustainable operation in space. With all of the above, fieldwork is an increasingly important element of education.

In Slovenian geography, field work has always been an important way of getting to know and exploring the landscape, which was also reflected in the education system. Despite this, it was officially included in the curriculum documents only in 1998. An analysis of the currently valid curricula for primary schools and various secondary schools shows that the design of general and staged or guiding objectives is so broad that it enables the inclusion of content- and methodologically diverse field work and excursions. The latter is directly defined and suggested in all curricula, which is an important basis for teachers to implement lessons outside of school. In addition to direct geography lessons and excursions, there is room for field work in schools in Slovenia also within the framework of activity days, as e.g. four cultural days, three natural science and three technical days, and five sports days are included in the primary school curriculum annually (Primary School Curriculum). In addition, or as a realization of the activity days, the elementary school also conducts weeks of nature schools in the public institution Center for School and Extracurricular Activities (CŠOD), whose main purpose is the promotion of learning in nature (CŠOD, 2024). In high school education, the matura exam is an important incentive for field work, as it includes 20% of the internal exam grade, which is obtained through field exercises. Geography competitions for pupils, which consist of theoretical and field work, also have an evident influence on the implementation of geographical field work. It should be added here that only students who choose geography as a subject at the final exam take part in the graduation field work, and geography competitions only reach those students who participate based on their interest and the mentor's engagement.

An extremely important role in creating the foundations for field work in schools is played by tertiary education, the goals and contents of the study programs that train future geography teachers. The latter and practical experience of field work, which teachers acquire in the process of their own education, are the basis for their later work in practice. 60% of the surveyed Slovenian geography teachers were of the opinion that they were sufficiently familiar with field work as part of their university education. Undoubtedly, they perceive the diverse advantages and positive effects of field work. Most often, they point out that field work enables connecting "theory with practice" through authentic contact with the landscape, that it increases the perception of the useful value of knowledge, deepens it and makes sense of it. It enables physical and mental activity and the development of several competences (from orientation in space to social competences and handling various aids). At the same time, it has a positive effect on the motivation of pupils and students.

Unfortunately, when it comes to organizing and carrying out field work, geography teachers also encounter several obstacles, as a result of which there is less field work

in Slovenian schools than it could be. Podobnik (2011, in Lipovšek 2016) also states why teachers avoid fieldwork:

- they feel insecure, thinking that they are insufficiently qualified to prepare and carry out field work;
- doubt the effectiveness of field work;
- they wonder about the rationality of field work, for which a lot of time and material resources are spent;
- are in a dilemma as to which types of tasks they best support in field work or implement the curriculum;
- they feel that they do not manage to connect sufficiently with the content and knowledge of other subjects;
- they wonder how to develop general, permanent, transferable lifelong knowledge through field work;
- they do not have developed assessment criteria;
- they do not have enough useful professional materials for preparing field work.
- In our research, at both levels of education, three key objective obstacles to the implementation of fieldwork emerged, namely:
 - administrative obstacles (due to the regulations for conducting lessons outside the school, for larger groups, an additional escort is necessary, as well as the preparation of a security plan, implementation adjustments in the collective);
 - waste of time (which is related both to the need to implement an extensive curriculum, to the very nature of the field work, and to the logistics of the implementation, as it is necessary to organize the schedule, companions to the field and replace their hours, etc.);
 - financial obstacles (transportation, procurement of appropriate field aids).

Regardless, shorter forms of geographical fieldwork are present in Slovenian schools, but could be more frequent. In high schools, they are especially encouraged by the matura exam. Annual elementary school interdisciplinary excursions to various Slovenian regions are also a reality, which are generally fewer in secondary schools, but are also organized outside the borders of the country. The content of field exercises and methodological approaches deserve special attention and encouragement in the systemic, research and didactic fields for the important reasons described in the paper.

Quality of life among young people in the Alps: Identifying life quality indicators

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Abstract

Measuring quality of life encompasses various dimensions, including individual perceptions and societal values. The Erasmus+ project Alpine Compass focuses on the quality of life for young people in the Alps, comparing their needs and challenges in France, Germany, Liechtenstein, and Slovenia through studies and interviews. This article combines literature analysis with interview opinions to identify new indicators for measuring quality of life. Quality of life is multifaceted, involving material conditions and subjective perceptions. Key results include the importance of a healthy environment, sustainable mobility, cultural offerings, mental health, and the impact of climate change on the future.

Keywords: quality of life, youth, life in the Alps, alpine regions, indicators

Izvleček

Kakovost življenja mladih v Alpah: Opredelitev kazalnikov kakovosti življenja

Merjenje kakovosti življenja zajema različne razsežnosti, vključno s posameznikovimi zaznavami in družbenimi vrednotami. Projekt Erasmus+ Alpski kompas se osredotoča na kakovost življenja mladih v Alpah in s pomočjo študij in intervjujev primerja njihove potrebe in izzive v Franciji, Nemčiji, Lihtenštajnu in Sloveniji. Ta članek združuje analizo literature z mnenji iz intervjujev, da bi opredelil nove kazalnike kakovosti življenja. Kakovost življenja je večplastna in vključuje materialne pogoje in subjektivne zaznave. Ključni rezultati vključujejo pomen zdravega okolja, trajnostne mobilnosti, kulturne ponudbe, duševnega zdravja in vpliva podnebni sprememb na prihodnost.

Ključne besede: kakovost življenja, mladi, življenje v Alpah, alpske regije, kazalniki



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1 Introduction

Ever since it was signed in 1991, the Alpine Convention has attached great importance to the population and culture of the Alps, setting itself the objective of "ensuring respect for, and the maintenance and promotion of, the cultural and social identity of the population living in the Alps (Alpine Convention, n.d.)". When it comes to quality of life in the Alps, it is particularly interesting to note that the Alpine Convention, from the beginning, proposed a broad definition of quality of life that included much wider objectives than economic development or the improvement of material living conditions and the environment. For example, it also included social wellbeing of Alpine inhabitants and people's personal perceptions and the cultural and value systems of a society.

Today, it is accepted that measuring quality of life involves taking an interest in several dimensions of people's situation: their state of health, level of education, degree of social integration, working conditions and levels of physical and economic security are also considered. The concept of quality of life also includes the personal perceptions of individuals and the culture and value structures of a society.

With this in mind, the Erasmus+ project Alpine Comp ass: Youth for quality of life in the Alps (2023-2024) aims at working on quality of life of young people in the Alps. The project compares the situation of young people in France, Germany, Liechtenstein and Slovenia based on existing research with young people living in the Alps.

The objective of this research is to improve the understanding of the needs and challenges faced by young people in the Alps. By young people, we include people in the age group between 16 to 30 years old. It also aims to compare what has already been written (literature analysis) and what young people think nowadays (interviews) to add contemporary concerns to the former studies if new indicators for a good quality of life emerge. Moreover, comparing young people's interview results from different nationalities gives a transnational perspective on quality of life, showing the necessity of a European alpine cooperation about that cross-border subject.

This information could give decision makers arguments for their political work, by helping them understand how to improve young people's life in the Alps, and thus life in the Alps in general. The goal is also to encourage them to consider young people's opinions and needs, as the latter represent the future of the Alps and are the one that are going to face all the upcoming economical, ecological and social challenges.

2 Methodology

This research paper has been conducted on the basis of existing studies, compared with interviews of young people living in the Alpine part of the four following countries: Liechtenstein, France, Germany and Slovenia.

For each country, a synthesis of the main literature findings about quality of life in the Alpine part of the country and/or among young people has been written, explaining which indicators they used for addressing quality of life.

Furthermore, interviews were conducted among fifteen young people from these countries. Four young people from Germany and France, five young people from Slovenia and two young people from Liechtenstein were interviewed, throughout 2023.

In each country, the purpose was to find a group of interviewees as diverse as possible, in terms of age, living environment, professional orientation and lifestyle, education, etc. to get a broad perspective.

We selected young people in predeterminate age group between 16 to 30 years old and living in different areas (cities/towns/villages). Nine of the selected interviewees were female, and five of the selected interviewees were male.

The interviews were conducted live (face to face) using a questionnaire we had prepared in advance. Interview was about 40 to 60 minutes long.

The questions were designed based on the learnings from ESPON methodology and findings from literature. Questions were formulated by lead partner of the project CIPRA Slovenija. Then, the final questions and indicators were reviewed by experts on quality of life and conducting interviews (ZRC SAZU Anton Melik Geographical Institute).

Questionnaire had three parts. First part had 12 questions which interviewees filled in alone (such as: questions about their age, location of living, net monthly income, level of education, current housing situation, living distance to different services ...). Second part had a table with different indicators and for each indicator you could chose how important (from 1-10) is this indicator for you and how accessible, considering the distance or economic accessibility, are the following indicators for you in the area you live (for example: owning a car, access to internet, healthy soil ...). Third part had 10 questions related to values, needs, wishes of places where they live (for example: what is quality of life for you, do you feel that you have enough free time ...). The purpose was to understand the perception of youth regarding quality of life in the Alps, to then compare it to the existing literature and finally to raise youth voices and make their opinions more considered by alpine politics (Erasmus+ project Alpine Compass: youth for the quality of life in the Alps, 2024).

3 Results

3.1 Literature review from France

In France, the indicators to define quality of life are based on the studies of the National Institute of Statistics and Economic Studies (INSEE). Before 2009, quality of life was mostly based on economic criteria such as the GDP (gross domestic product). Since 2009 and the Stiglitz-Sen-Fitoussi commission report (Stiglitz, Sen and Fitoussi, 2009) ordered by the former French President Nicolas Sarkozy, more holistic indicators have been considered to rate quality of life in France. Thus, this notion is defined on the one hand by individual material criteria such as the salary, the working conditions, the accommodation, health conditions etc (Jakoubovitch and Lavergne, 2016). On the other hand, quality of life is also rated according to the subjective perception of well-being of everyone (Durieux and Méreau, 2023). This well-being is based on indicator linked to the environment offered by the territory people live in (access to services, housing conditions, access to nature ...) but also based on the perception of the individual living condition (physical and economic insecurities, trust in the government, quality and frequency of social ties, stress, anxiety ...) (Grosinger and Gentiane, 2023). So many indicators in a wide range of both objective and subjective dimensions show the complexity of properly rating quality of life (Jakoubovitch and Lavergne, 2016). This was a general definition made to discuss

quality of life in the whole territory of France. However, our study focuses on young people in the Alpine region.

The INSEE made study in the two France's Alpine regions. One has been carried out in southern part of France in region Provence Alpes Côte d'Azur (Durieux and Méreau, 2023) and another in the southeast-central part of France in region Auvergne-Rhône-Alpes (Jakoubovitch and Lavergne, 2016).

The Provence Alpes Côte d'Azur region benefits from many advantages such as the low air pollution and unspoiled natural environment, provides a pleasant living environment and encourages the practice of sports.

The Alpine part of the Provence Alpes Côte d'Azur region seems to be divided into two different territories when it comes to quality of life. First, the area with a lot of ski resorts. In this area, the employment rate is very high, and the unemployment rate is twice lower than the regional average. However, employment is mostly linked to tourism and is more precarious and seasonal and pays less than the regional average (29,133 € per year).

On the other hand, the other area formed by the Champsaur Valgaudemar and Guillemestrais-Queyras (both federations of municipalities), more isolated and with few ski resorts, shows a lower quality of life. The inhabitants are usually older, with a lower income. For the young people living there, quality of life is lower than in the rest of the Provence Alpes Côte d'Azur region because the unemployment rate is higher for them, they live quite far from their work and have the highest commuting time to access services in the region. In the whole Provence Alpes Côte d'Azur region, the young people's unemployment rate is higher than the French average.

Thus, precarious employment, unemployment and long commuting time to services are the indicators that lower the most quality of life of the inhabitants, especially young people, in this region.

The INSEE survey about the Auvergne-Rhône-Alpes region (Jakoubovitch and Lavergne, 2016) showed that the areas comprising municipalities in and around the Alps are characterised by a low average level of urbanisation and relatively poor access to services. With the presence of ski resorts in these areas, most of the jobs are in tourism. The result is a favourable employment situation, with most residents working close to home. However, the proportion of fixed-term contracts (CDD) in salaried employment is higher than in other areas, due to the often-seasonal nature of the activity.

Therefore, according to the INSEE survey, quality of life in the Alpine part of the Auvergne-Rhône-Alpes region is improved by the direct access to nature and outdoor activities, the high rate of employment and the short distance between home and work. On the other hand, what makes the quality of life lower in this Alpine area is mainly the distance to reach services.

Nevertheless, none of these studies is focused on young people. It also focuses more on the material and objective indicators such as salary, accommodation and access to services rather than subjective ones like anxiety, trust in the government, etc. There are indeed very few studies about the quality of life of young people in the French Alps. However, indicators such as the unemployment rate among young

people, the cost of housing, and transport statistics can provide an insight into the challenges they face. Then we can see that literature about quality of life in the French Alps lacks surveys focused on young people and more subjective indicators.

3.2 Literature review from Germany

Quality of life in Germany is a multifaceted concept with diverse definitions. According to the Federal Center for Health Education, it involves both objective and subjective elements, shaped by the interplay of various factors (Noll, 2022). The Federal Agency for Civic Education emphasises its comprehensive nature beyond material prosperity. The German Federal Government (Presse und Informationsamt der Bundesregierung, 2016) defines it as a concept striving for economic, social, and ecological goals, focusing on better quality, fair distribution, and improved living conditions.

To provide a comprehensive report on the study situation in Germany on the topic of "Quality of life of young people in the Alpine region", we first researched current studies. It was noticeable that there is not one all-encompassing study that takes all aspects into account. On the contrary, young people between the ages of 18 and 29 were generally often left out of studies; in particular, studies on the topic of "good life" (gutes Leben) focused more on children and teenagers, on pensioners or on society in general. Nevertheless, there are also some studies in Germany that deal specifically with the quality of life of young people. Three of these studies will be presented in more detail below, which have examined quality of life from the following perspectives: rural areas, the effects of the lockdown period and current crises, and attitudes and behaviours. It is also important to note that, as far as the research on which the report is based is concerned, there are hardly any studies about quality of life in the German Alpine region, especially not regarding people between the ages of 18 and 29.

The Shell Youth Studies (Albert et. al., 2019) are conducted with young people aged 12 to 25 in Germany every four years since 1953 and aim to provide a comprehensive insight into the life situation, attitudes, and behaviours of young people. The 18th Shell Youth Study, published in October 2019, analyses the living conditions of young people from a political and social perspective. This current study not only looks at young people today but also provides impetus for socio-political thinking. In addition to political and economic factors, family, friendship, and school influences played a decisive role. The young people showed increased political interest, expressed their concerns clearly and were generally satisfied with their lives. Despite a general satisfaction with democracy, many young people expressed dissatisfaction with politicians. Family, friends, and partnerships were very important to them, as were environmental awareness and a high standard of living. The young people were optimistic about their personal and social future but had an awareness of social grievances. They demanded change to actively participate in shaping their future (Albert et. al., 2019).

The "Youth in Germany" study (18th Shell youth study, 2019) shows that young people are suffering more than other age groups from the effects of current crises such as the coronavirus pandemic, climate crisis, wars, and inflation. A permanent crisis mode has led to financial hardship and psychological stress for the young age group which are mostly in school or other forms of education and training. Almost half of 14 to 29-year-olds in Germany experience stress compared to only a fifth of 50 to 69-year-olds. The authors of the study, researchers in the field of youth Simon

Schnetzer, Klaus Hurrelmann and political scientist Kilian Hampel, attribute the high level of psychological stress among the younger generation to high personal expectations of the future (Schnetzer et. al., 2023). It is interesting to note that the SINUS survey (2022), which is explained in more detail in the next section, primarily observes other factors such as the climate crisis as a cause of psychological stress. With all the findings of the study, the authors emphasise the need for a rapid expansion of mental health support services to counteract a possible consolidation of depression, addictive behaviour and isolation among particularly stressed young people (Schnetzer et al., 2023).

Following on from the study, we will now turn to the previously mentioned SINUS survey (2022), which provides results on attitudes towards climate change among teenagers. It can be assumed that the findings regarding the impact of the climate crisis on the quality of life of 14- to 17-year-olds can also be applied to the here discussed age group of 18- to 29-year-olds. The survey results show that fear of the effects of climate change is widespread among young people, with 64% expressing great or moderate fear of the effects of climate change on their future. The survey also highlights fears of specific consequences such as extreme weather events, loss of habitat and possible wars over water. This anxiety can have a significant impact on young people's quality of life, including stress and depression. The emotional burden can lead to feelings of powerlessness, sadness and despair, limiting future choices and affecting social interactions. However, there are also positive aspects, as climate anxiety can lead to an increased commitment to environmental protection (SINUS Institut, 2022).

The research project "Stadt. Land. Wo? What drives young people" (Schäfer et. al., 2020) by the Katholische Landjugendbewegung Bayern (KLJB) is dedicated to the challenges in rural areas of Bavaria and examines the reasons for young people leaving the countryside. The young generation moves from the countryside to the city and often stays there, which has negative consequences for their communities of origin and the quality of life of young people there. Against this background, the KLJB study examined the reasons why young people leave rural regions in Bavaria, but also why they stay there or return. The study, conducted in various regions of Bavaria (alpine and non-alpine), emphasises the positive attitude of young people towards rural areas, despite challenges such as demographic and social structural change. The strong spatial identity, characterized by family ties and social connections, significantly influences the decision to stay in rural areas. Despite general satisfaction, there are infrastructural deficiencies in the area of needs-based housing, and political influence is criticised. The study emphasises the importance of value-based life planning and calls for comprehensive social support, especially from local authorities. The study concludes that youth policy should be seen as a fundamental issue and targeted measures should promote the willingness to stay and return. To limit migration from rural regions, the study emphasises the need for security (Schäfer et. al., 2020).

The study situation, shown exemplary by the presented three studies paints a clear picture of the situation and needs of the younger generations in Germany and especially the rural parts of Germany. Young people in Germany are suffering more from the effects of current crises than older age groups and are therefore more often under psychological stress. In addition, the situation of young people in rural areas reveals shortcomings in terms of infrastructure and political participation (Albert et. al., 2019; Schäfer et. al., 2020; Schnetzer et. al., 2023; SINUS Institut, 2022). In

general, young people are demanding a greater influence in shaping their own future. Even though there are no specified studies for the Alpine Region of Germany yet, they are part of the study group in all studies and therefore the results also represent the situation of youth in the German Alpine region. It can moreover be assumed that the situation of young people aged 18 to 29 in the German Alpine region is even more critical than shown in the cross-regional studies, as the infrastructural problems of rural areas are exacerbated here by the geography.

3.3 Literature review from Slovenia

When reviewing the literature on quality of life we found out that researchers have tended to focus on aspects, short periods or the population, using a variety of indicators. Consequently, it has become apparent that there has been no conducted longitudinal study on the quality of young people in Slovenia.

Quality of life is influenced by several factors, ranging from material circumstances, career, health, education, leisure, economic and physical security, natural and living environment (Nared, 2022). First and foremost, it is about different perceptions of the circumstances of an individual's life. For example, someone living in a village may miss certain infrastructure – transport links, cultural institutions or shops and consequently consider their quality of life to be lower than that of an individual living in a city. On the other hand, the latter may have all the infrastructure but miss the unspoiled nature of their environment or be disturbed by noise.

According to Eurostat (2022), Slovenians are above the European average in key indicators on housing, working conditions, leisure, social relations, safety and health, with material living conditions or finances being the only two indicators that score lower. The survey conducted by Juvan Pobiljšaj (2019) used objective indicators – the material conditions of the population, accessibility of services and goods, and the poverty rate – showed that the subjective assessment of the quality of life of Slovenians is on average satisfactory. The survey by Bučinel et al. (2022), which included young people, focused on the quality of living, housing and jobs. Housing was identified as the most important issue, followed by social life, interpersonal relations and social integration. A more detailed analysis showed differences between those living in rural and urban areas, between school and university students and those in employment, and between those with a housing problem and those without a housing problem. Research in Slovenia on quality of life has also included the elderly in home environment (Mežan, 2021), the quality of life of people with intellectual disabilities (Valentič Ponikvar, 2013; Zahirovič, 2015) and the impact of physical activity as an important factor on the quality of life of young people (Valenčič, 2020). Vrabič Kek (2012) in the research called *Kakovost življenja* (Quality of Life) mentions key dimensions of quality of life such as material conditions (income, consumption, wealth), health, education, personal activities and work, governance, social ties, environment and security (economic and personal). People's perception of the world, the environment in which they live, and social development are also becoming increasingly important as a measure of quality of life. Nared (2022) has designed a quality-of-life model as a more holistic alternative to the current way of measuring the development of areas, which is based mainly on economic aspects of development. In the area of material conditions, all of Slovenia is above European average, in the area of self-esteem, social and environmental inclusion, including ecosystem services and biodiversity, western Slovenia is slightly above average from a European perspective, and in the area of personal and socio-economic wellbeing,

Slovenia is below the European average. The division between western Slovenia, with a higher territorial quality of life, and eastern Slovenia, with a lower territorial quality of life, has been confirmed for some time.

3.4 Results from the interviews in France

In the interview, the participants (young people living in the French Alpine region) were asked what they thought constituted a good quality of life and what values and factors play a part in it.

The environment they live in is the key factor for a good quality of life according to the majority of French young people interviewed. For three participants, an easy access to nature is important in their everyday life. Two people underlined the importance of low pollution.

Various other factors contributing to a good quality of life were mentioned by individual participants. One of them added the necessity to have meeting places like bars in order to create friendliness. This will is linked to one of the values they enhanced the most during the interviews: the need for social bonds.

Someone explained that the cultural facilities as well as the presence of schools were important.

Additionally, two participants highlighted the importance of employment in quality of life. One said that a wide range of job offers is necessary but sometimes hard to reach in the mountain areas. The other one explained that employment can lower quality of life if the job takes too much room and doesn't allow the person to have enough time for personal life.

"A bad quality of life: when work gets the upper hand over everyday life, leisure time and friends (job too intense)."

The topic of easy mobility has also been mentioned by one participant, specified by straight journeys, public transports running at regular hours and with many links. Access to primary needs (accommodation, food ...) and the need for free time alone are also criteria that have been mentioned one time during the interviews.

One-person summarised quality of life the following way: "It means living well in that place, feeling good both physically and emotionally".

Aspects of the own surroundings

We also questioned the participants about the type and location of their housings, as well as their opinion on the quality of their environment.

Regarding housing, the results of the interviews show that the type and location are usually a mix between choice and necessity. One person said she chose to share a flat, for a lower rent and for friendliness. One person lives at her parents' house because she's studying next to where they live. Two people explained they chose to live in the city centre. Two people chose they studies according to their will to live in the mountain area: "It's a choice! Because I like the mountains and that's why I chose to live and study there (just like my parents did)."

All the participants agreed to say that the location of their housing suits their needs and values, especially for the balance it offers between an easy access to the mountain and the benefits of the city (culture and meeting places).

Nevertheless, they have mixed opinions regarding the quality of their environment. The city of Grenoble had been quoted by four participants who underlined its high pollution rate and the heavy heat in summer. One other said that his mountain valley is too urbanised and contaminated, especially during the touristic period because of all the traffic jams. On the other hand, two people like the fact that their natural surroundings allow them to escape from the city fast and easily.

Aspects considering the local community and amenities

Another approach to the topic of quality of life was linked to how they feel in their local communities. To the question of whether or not the participants felt like they could truly express themselves and be who they are without judgement, they all answered yes, in big cities as well as in smaller towns. However, one individual explained that in his region it is “all or nothing”, which means that when you don’t think like the majority you should keep it for yourself.

Regarding the way to be more supported and connected to their communities, two people talked about the need for more public transports leading to the surroundings, especially to reach the mountain area. One said he should get more involved in local associations. Another would like his local community to ask more for the inhabitants’ opinions.

What could be improved is for three of them a better access to the mountain through more public transport but also through more outdoor activities offered at school. For one person living in a small town between a big city and a ski resort, public transports are also very much needed as after a certain hour early at night, there is no way to get to these places without a car.

In the big cities, one of the things that could be improved for two people is the pollution rate and the heat: they would like more solutions to cool down the city in summer. One person would like the quay to be car-free and another one would like the cycle paths to be improved and safer.

Here, the topic that is the most important is therefore mobility both in and out of the city to reach the mountain area.

Finally, when we ask the participants what factors are going to have the biggest impact on their life in the next decade, two main answers are highlighted. First, three people underlined the impacts of climate change on their future, having for instance an impact on winter outdoor activities. One person linked it to politics, saying: “Climate change and the political decisions taken to block its consequences, so the political factor is going to have the biggest influence on my future”.

The second most stressed topic is employment. Two individuals explained that their job is going to dictate if they are happy according to their work-life balance, where their job is located and how well they feel doing their job.

In conclusion, even though young French people's opinions on what good quality of life is diverse, a few recurrent elements were underlined by all interviews. Environment and employment are key factors for a good quality of life according to young French people.

Environment in the city can be improved especially through a lower pollution rate. What they like about their environment in the Alps is the easy access to nature, close to their city.

The topic of better public transport is also very significant for them. More efficient and regular connections between the city and the rural mountain areas are currently lacking and could greatly enhance their quality of life.

Bonding and social interactions are a main need for youth in the Alps. They want to be supported and be able to meet people, as well as being supported and consulted by their communities.

Employment is important as it defines the place, they are going to live in for many of them, which has a big impact on their quality of life. The job itself is also an essential criterion for young people, and that's why they think a good work-life balance is necessary. Employment is for that matter one of the main topics that is going to impact their life in the future, with climate change. A part of the impact comes from the political answer to climate change.

3.5 Results from the interviews in Germany

In the interview, the participants were asked what they thought constituted a good quality of life and what values and factors play a part in it.

For three participants, a crucial factor for a good quality of life is their living environment, encompassing aspects such as proximity to nature and easy access to leisure activities. Another significant aspect for three individuals is their personal way of life, emphasizing the ability to shape their lives according to their preferences, including maintaining a balanced work-life dynamic and the freedom for personal development. "Mix of work-life balance and personal development."

Various other factors contributing to a good quality of life were mentioned by individual participants. These include the importance of family and friends, affordable housing, and the quality of drinking water. In terms of values associated with quality of life, all participants emphasize the significance of interpersonal relations, expressing that strong relationships within their social circles are vital. "I believe there is a narrower circle and an outer circle [...] the narrower circle would be like care, affection, family, friendship, respect for each other".

Additionally, two participants highlight the impact of societal factors, such as living in an open, progressive, and democratic society that values equality. "The outer circle would be something like democracy, human dignity, and all these things that one can't easily influence so directly".

Individual values mentioned include the ability to express oneself, freedom, and the availability of leisure time.

Aspects of the own surroundings

The reasons for the location and type of housing vary among participants. For three individuals, the location is a matter of choice, driven by a desire to live in the mountains. However, the specific location is determined by necessity, as it is tied to job opportunities and offerings. "Both, but I chose to live in the mountains, so it's optional. But the specific place of residence is then again due to the job."

Two participants mention residing in a shared flat because they enjoy the experience of living with others. Regarding whether the location aligns with their wishes, needs, values, and priorities, three participants indicate that the situation only partially fulfils their needs. While nature is generally viewed as a positive factor, the lack of certain amenities found in larger cities, such as nightclubs, is seen as a drawback. "Conditionally, so in any case it fulfils my wishes, I wanted to go to the mountains and from there it's great. But of course, the village location is somewhat different than the big city."

Only one person expresses satisfaction with their current situation. When asked about the quality of their natural environment, all four participants affirm that it is good. One participant notes that, while their environment is suitable for a big city, there is still too much traffic and insufficient natural spaces. Three participants highlight the accessibility of nature in their surroundings, including mountains, forests, and lakes. "I think the best quality I have at my place of residence is nature, and for me that is a very big point for my quality of life. And here nature is just very quickly accessible"

Aspects considering the local community and amenities

Participants' experiences regarding self-expression vary based on their location. One individual, residing in a big city, feels they can express themselves without judgement. However, two participants in smaller towns find it challenging, with one noting the need for adaptation in a small village: "No, not a 100%, because it is a small village, and I have the feeling that one has to adapt to a certain extent."

And the other expressing difficulty in avoiding judgement despite being able to express themselves. Responses to feeling more connected and supported by the local community differ. Two participants do not feel the need for increased connection, while one believes openness to the surrounding society is essential. Another participant would feel more connected with a higher cultural offer for young people. "Maybe a little bit more cultural offerings for young people. Connecting of young people outside their own bubble."

Participants also share perspectives on what could be improved in their town/city/village. Three emphasise the need for changes in infrastructure, including reducing traffic, improving public transport, and enhancing opportunities comparable to those in cities (cafés, shopping, etc.). "There could be more economic diversity. For example, we don't have any cozy cafés where you can sit inside."

Another participant expresses a desire for more cultural offerings tailored to the local community rather than primarily for tourists.

The participants foresee several factors influencing their quality of life in the next decade. Three individuals highlight the significance of their jobs, emphasizing factors such as a good salary, work-life balance, and job satisfaction. Additionally, two

participants express concerns about the impact of climate change: "I believe for me personally climate change. Both professionally and privately," and its associated social effects on their lives in the future. Other factors mentioned include the importance of interpersonal relations, travel, and the influence of politics on their quality of life.

3.6 Results from the interviews in Slovenia

Most respondents emphasise access to services and living in an environment surrounded by nature when defining quality of life. They also highlight the opportunity to develop a career, the presence of an active local community and access to major cities, with an emphasis on public transport. "Quality of life is about having a choice between different options and not being constrained by them."

Values associated with quality of life are nature, freedom and autonomy, access to services, access to quality food and a safe environment that is not threatened by natural disasters. Family and cultural values, good relationships and belonging to a community, and support for young people are also of a big importance. "Peace, nature, respect, good neighbourhood relations."

Quality of life for individuals means living without restrictions, a good ratio between services and the natural environment, and living up to modern standards with access to healthcare and recreational areas. "Quality of life for me is being able to do what you want and being happy with yourself."

Aspects of the own surroundings

When asked whether the location suits their wants, needs, values or priorities, one respondent mentioned that the location suited them perfectly, while others had mixed feelings. "There are also constraints in our local area related to the number of inhabitants. Certain activities are simply not worthwhile due to (too) low demand (e.g. fitness)."

One respondent mentioned that their current place of residence generally reflects their personal choice and preferences, but they also mentioned some factors that might influence them to move. "I would be forced to move if property prices continue to rise or if the city becomes too crowded with foreign capital".

They mention too much tourist pressure and the associated overcrowding, the invasion of foreign capital in relation to housing and financial constraints.

Aspects considering the local community and amenities

All respondents point to differences between urban and rural populations. The latter are more likely to be conservative thinkers, therefore respondents feel the inability to express themselves in their society. "It is difficult to define oneself ideologically without being judged."

There are also challenges of acceptance in the local environment in terms of generational differences and political orientation. "If you think differently, you stand out."

On the one hand, living in a village offers easy access to unspoilt nature, but on the other hand it has its drawbacks - lack of adequate services, poor accessibility to services and poor transport links.

To feel more involved and connected to the local community, respondents stress the importance of a variety of social, cultural and sporting events and joint projects where they can socialise and share experiences. "I miss activities such as evenings for young people, board games, choir, other activities ..."

Particular attention could also be paid to creating opportunities for intergenerational meetings and networking, as well as to creating more places where such associations could be organised. On the other hand, one of the respondents misses the municipality's greater commitment to such efforts. "We are already connected, but it could be improved by having some joint projects, to have the possibility to connect even better, to create the opportunity to spend time together, because now we mostly just meet in bars or on the street."

When asked about improvements in their environment, they point to activities and locations where young people could socialise and have fun. Better transport links and public transport (taxis and bike hire), a better attitude of the municipality towards the local population, accessibility of services and improvements in the health system are essential. "More opportunities for individual participation, more cultural events, more dedicated places in nature for relaxation, space for a workplace in, more measures to enable commuters to live a more sustainable life."

Respondents point to extreme weather events related to climate change as factors affecting the future of their quality of life. "On the other hand, extreme events such as strong winds, droughts, heat, storms are likely to increase in the coming years. There will probably be even less snow in winter ... All these phenomena will also have economic consequences."

Employment and housing affordability for young people, getting a job that is suitable for their education are also important issues. Young people are also concerned about the future because of increasing pressures from tourism and the resulting deterioration in the quality of the natural environment. "Career, family, pollution, immigration of foreigners - even more housing unaffordability and cultural challenges."

3.7 Results from the interviews in Liechtenstein

Both interviewees expressed a strong emphasis on the importance of a high quality of life, which encompasses feeling safe, expressing oneself freely, and having autonomy in decision-making. They prioritize access to education, healthcare, and the ability to live independently. Both individuals also appreciate the natural environment.

Looking ahead, both interviewees expressed concerns about their post-graduate prospects, emphasizing the importance of finding a job, achieving financial stability, and establishing a comfortable living situation.

They showed concerns about societal norms limiting personal expression and the desire for more diverse cultural experiences. Suggestions for improving community engagement include reducing gossip, providing clearer information about available resources, and expanding educational and career opportunities, especially for youth.

Both interviewees highlighted the need for better transportation options, shopping facilities, and nightlife venues. Empowering young people through voting rights and broader representation in decision-making processes is seen as crucial for enhancing community dynamics for the future. They also acknowledged factors such as education, career choices, climate change, and political changes that could impact their quality of life.

4 Discussion

4.1 Comparison of literature findings

All the literature from the three studied countries expresses the diversity of indicators to be considered when it comes to rate quality of life. From material indicators to subjective perception of each individual, quality of life is truly a complex concept to define. In all studies, generally the same main indicators were found, but not necessarily with the same level of importance. For example, indicators found more particularly in the German literature are the importance of policies and political participation in the youth well-being and emotional burden and anxiety (especially due to climate change) present among German young people. Even though German literature focuses on youth, there's a lack of literature about the Alpine part of the country. This is something found in the French literature, showing that one of the major indicators influencing quality of life in the French Alps is the working condition and salary linked to it (long- or short-term contracts, commuting distance, access to a diversity of jobs ...). In comparison, the Slovenian literature put housing (access and quality) as the most important indicator, followed by social life. However, there are no studies which would only focus on the Alpine part of the country.

Whereas literature in France, Slovenia and Germany lack studies about youth in the Alpine regions, French literature does focus on the Alpine area, but not on young people. All of it shows a general lack of studies focusing both on the Alps and on young people, in each country but also on the Alps in general..

4.2 Comparison of interviews

The findings provide a detailed understanding of young people's perspectives on quality of life in the Alpine region, highlighting both shared values and regional nuances. While traditional studies, particularly in French literature, often focus on employment rates and salaries, young interviewees prioritize work-life balance, connectivity, and access to nature. Public transport that facilitates easy access to cities and mountain areas is a critical factor, reflecting a broader view of mobility beyond mere commuting times.

A notable divergence from traditional research is the increasing concern about climate change, which young people see as a key factor shaping their future quality of life. Social connections and community bonding are also emphasized, surpassing their representation in earlier studies. Across all countries, proximity to nature and low pollution levels remain central indicators of a good living environment.

When comparing interviews from different Alpine countries, young people show a strong consensus on key priorities. These include access to nature, robust public transport networks, and strong interpersonal relationships. Suggested improvements focus on greener urban spaces, better transport links to remote areas, and increased

cultural and social activities. However, respondents noted challenges in expressing themselves in smaller, conservative communities compared to larger cities, where they feel more freedom to share their ideas.

Looking ahead, climate change emerges as the primary concern for young people across the Alps, followed by employment-related factors such as work-life balance, well-being, and job opportunities. Political representation is particularly important for Liechtenstein youth, while Slovenian respondents emphasize the negative impact of mass tourism, which they feel prioritizes tourists over residents. These findings align with broader studies that critique inadequate infrastructure and highlight the impact of global crises like the pandemic and climate change.

The interviews underscore the multifaceted nature of quality of life for young people in the Alps, with environmental, social, and economic dimensions interwoven. Improvements linked to reducing urban pollution, enhancing public transport, and fostering cultural and social opportunities are seen as critical steps. The results reflect a clear alignment across Alpine countries, emphasizing shared priorities and aspirations for a better future.

5 Conclusion

The first and key question we looked deeper into in our work is about quality of life at its core: What is quality of life? Through the literature review from each country studied in this research, we noticed that there are not yet enough standardised scientific studies on the topic of young adults in the Alpine region.

We focused our research on finding common denominators on quality of life seen by young people in the Alps, interviewing fifteen individuals from 3 Alpine countries: France, Germany and Slovenia. The following key issues have been identified as cross-borders indicators for a good quality of life in the Alps for young people:

- The significance of living environment: nature and work-life balance
For the younger generation in the Alpine region, the living environment is key for a good quality of life. Whether in Germany, France or Slovenia, the interviewees declared the importance of easy access to nature from the place they live. Above all, the desire to pursue leisure activities and have a close connection to nature has an impact on the question of available time and how it is used in everyday life. That is why the working conditions are important for them. The necessity of job security, a wide range of job opportunities, but also a job that is interesting with a high degree of flexibility, are criteria that influence the quality of life of the younger generation. Even more important is the work-life balance, with enough time to fulfil yourself. Necessity of considering the inhabitants more than the tourists is also something related to a good living environment, as mass tourism has big impacts on both biodiversity and quality of life of the people living in the touristic areas.
- Mobility as one of the most important services
Who hasn't experienced it: you run, you hurry and yet the bus or the train runs right away in front of you? This is less of a problem in towns and cities, as the next one is sure to arrive soon, but in rural areas it is a more difficult task. Often people, especially young people, only have the option of hitchhiking or returning home. This is not a new issue and in the course of our work, regardless of which Alpine country we are in, from France to Slovenia, we are confronted with this topic time and again. During the discussions with the young people, whether in

the interviews or in the working groups, the topic of mobility was mentioned frequently, particularly in relation to:

- **City-mountain connections:** Access to nature and mountains is limited in many Alpine countries. There is a need for improvement in the entire Alpine region, even if there are differences between the respective countries, the situation also varies from region to region within the respective countries.
- **Public transport services:** The availability of public transport in rural areas to get to the nearest large town or neighbouring village to do the shopping, visit friends or family or simply to get to work is very limited. It is often administrative responsibilities, which vary from one Alpine country to another, that limit this offer and do not sufficiently adapt it to the needs of young adults.
- **Need for cultural offerings and social interaction**
Depending on the Alpine country, the services offered vary, however most young people interviewed underlined the lack of services, especially cultural offerings. Places to meet new people and interact are also very much needed for young people, showing the significance of strong interpersonal relations, with people they can rely on.
- **Climate change: the main impact for the near future**
The Alpine region has warmed twice as much as the global average since the end of the 19th century. From heatwaves to severe weather events, glacier melt, water shortages on the one hand and flooding on the other... The list of negative effects on nature and the environment is long. For young adults from the various Alpine countries, climate change and its effects continue to be the issue that will have the greatest impact on their lives over the next 10 years. They underlined its objective impacts on leisure activities or natural resources, but also the emotional burden they can carry from climate change: anxiety and depression. The political answer to it had been mentioned several times as a criterion for a good quality of life, underlining the importance of political consideration for young people's needs and wishes.

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Povzetek

Projekt *Alpine Compass* se je posveča kakovosti življenja mladih, starih od 16 do 30 let, v alpskih regijah Francije, Nemčije, Lihtenštajna in Slovenije. S pregledom obstoječe literature, izvedbo intervjujev in metodologije "živih laboratorijev" ta raziskava opredeljuje izzive in potrebe, specifične za mlade v teh območjih. Cilj projekta je ponuditi vpogled odločevalcem za izboljšanje življenjskih pogojev in spodbujanje trajnostnega razvoja v Alpah. Kakovost življenja je razumljena kot večdimenzionalen pojem, ki vključuje tako objektivne dejavnike (npr. dohodek, stanovanjske razmere, dostop do storitev) kot subjektivne zaznave (npr. počutje, duševno zdravje, zaupanje v vlado, občutek sprejetosti takšnega, kot si). Takšen celosten pristop je usklajen z Alpsko konvencijo, ki poleg gospodarskega razvoja poudarja tudi kulturne, socialne in okoljske vidike.

Metodologija je vključevala analizo obstoječih raziskav o kakovosti življenja v alpskih regijah in intervjuje s 15 mladimi iz Francije, Nemčije, Slovenije in Lihtenštajna. Intervjuji so raziskovali kazalnike, kot so dostop do storitev, stanovanjske razmere, kakovost okolja in osebne vrednote. Ugotovitve so bile primerjane med državami z namenom odkriti podobnosti in razlike. Raziskava poudarja pomen razumevanja pogledov mladih za učinkovito naslavljanje njihovih potreb.

V Franciji se kazalniki kakovosti življenja opirajo na raziskave Nacionalnega inštituta za statistiko in ekonomske študije (INSEE). Pred letom 2009 so bila merila osredotočena predvsem na ekonomske vidike, kot je BDP. Po poročilu komisije Stiglitz-Sen-Fitoussi iz leta 2009 pa so bila vključena tudi bolj celostna merila, med njimi subjektivne zaznave, kot so ravni stresa in zaupanje v vlado. Raziskave v regiji Provence-Alpes-Côte d'Azur razkrivajo razlike med območji s smučarskimi središči in bolj oddaljenimi predeli. Prva imajo visoko zaposlenost, a pogosto sezonsko in nestabilno delo, druga pa višjo brezposelnost in slabši dostop do storitev. V regiji Auvergne-Rhône-Alpes narava in zaposlitvene možnosti prispevajo h kakovosti življenja, a slaba dostopnost storitev to zmanjšuje. Študije redko obravnavajo posebej mlade ali subjektivne dejavnike, kot je anksioznost.

V Nemčiji je kakovost življenja opredeljena celostno – z ravnotežjem med ekonomskimi, socialnimi in okoljskimi cilji. Kljub temu številne raziskave izključujejo mlade odrasle med 18. in 29. letom. Shelllova raziskava mladih (2019) kaže, da nemški mladi cenijo družino, prijateljstvo, okoljsko ozaveščenost in politično udejstvovanje, a so nezadovoljni s političnim vodstvom. Raziskava Mladina v Nemčiji izpostavlja duševne stiske zaradi pandemije, podnebnih sprememb, vojn in inflacije. Skoraj polovica mladih poroča o izrazitem stresu, za razliko od le petine starejših odraslih. Podnebna anksioznost je pogosta in vpliva na duševno zdravje, hkrati pa spodbuja okoljski aktivizem. Poudarjena je potreba po širši dostopnosti storitev za duševno zdravje za mlade.

V slovenskih alpskih regijah literatura izpostavlja močno povezanost med ohranjanjem narave in kakovostjo življenja. Mladi cenijo dostop do neokrnjene narave za rekreacijo, vendar se soočajo z omejenimi zaposlitvenimi možnostmi zunaj turizma. Intervjuji razkrivajo zaskrbljenost glede dostopnosti stanovanj za mlade družine in slabe javne prometne infrastrukture na podeželju. Čeprav slovenske politike poudarjajo trajnostni razvoj v Alpah, pogosto nimajo strategij, osredotočenih na mlade, kot so stabilna zaposlitev ali podpora duševnemu zdravju.

V Lihtenštajnu majhnost države in visoka življenjska raven ustvarjata posebne razmere za mlade. Intervjuji kažejo, da cenijo varnost in bližino narave, a se soočajo s pomanjkanjem kulturnih dejavnosti in družbeno izolacijo zaradi majhnega prebivalstva. Zaposlitvene možnosti so na splošno dobre, a številni mladi izražajo skrb glede dostopnosti stanovanj ob prehodu v odraslost.

V vseh regijah se pojavljajo skupne teme. Zaposlitvene težave so izrazite – mnoga delovna mesta v turizmu so sezonska, nestabilna in slabo plačana. Podeželska izolacija omejuje dostop do osnovnih storitev, kot sta zdravstvo in izobraževanje, dolgi prevozi pa zmanjšujejo kakovost življenja. Duševne stiske med mladimi so pogoste zaradi ekonomskih pritiskov in podnebne anksioznosti. Kljub izzivom mladi zelo cenijo bližino narave, čeprav jih skrbi njeno onesnaženje in degradacija.

Raziskava izpostavlja pomembne razlike v kakovosti življenja mladih po alpskih regijah. Čeprav mladi cenijo naravo in skupnostne vezi, ostajajo težave, kot so nestabilna zaposlitev, slab dostop do storitev in duševne stiske. Odločevalci morajo dati prednost strategijam za mlade, ki bodo odpravile te vrzeli in spodbujale trajnostni razvoj regij. Projekti, kot je *Alpine Compass*, poudarjajo glas mladih in prispevajo k bolj vključujoči prihodnosti prebivalcev Alp.

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Exploring Regional Disparities and Stakeholder Engagement in Slovenian EIP-AGRI Projects

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Abstract

The European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) was introduced to enhance EU's capacity for agricultural innovation by bridging the gap between research and practise. This paper explores the implementation of EIP-AGRI Operational Groups in Slovenia, focusing on spatial distribution, stakeholder networks, and thematic priorities. Findings indicate that farmers often take a passive role in innovation processes. Strengthening their role as co-creators could improve applicability impact. Environmental sustainability and climate adaptation are key thematic priorities, but project selection remains administratively driven rather than reflecting stakeholder needs. A higher concentration is found in the Eastern and Central Slovenia, likely due to agriculture's role, farm density, as well as support networks, including educational, research institutions and advisory services.

Keywords

EIP-AGRI Operational Groups, agricultural innovation, multi-actor networks, innovation & agricultural policies

Izvleček

Analiza regionalnih razlik in vključenosti različnih deležnikov v EIP-AGRI projektih v Sloveniji

Evropsko partnerstvo za inovacije na področju kmetijske produktivnosti in trajnosti (EIP-AGRI) je bilo uvedeno z namenom krepitev inovacijske zmogljivosti in premostitve vrzeli med raziskavami in prakso. V prispevku preučujemo prostorsko razporeditev, mreže akterjev in deležnikov ter tematska področja EIP-AGRI operativnih skupin v Sloveniji. Ugotovitve kažejo, da imajo kmetje pogosto pasivno vlogo. Krepitev njihove vloge kot so-ustvarjalcev inovacij bi lahko izboljšala praktično uporabo in zagotovila dolgoročni učinek. Ključni tematski področja sta okoljska trajnost in prilagajanje podnebnim spremembam, vendar njun izbor predvsem določajo administrativna merila. Večja zgoštevitev EIP-AGRI projektov je v vzhodni in osrednji Sloveniji, kar je povezano z vlogo kmetijstva, številom kmetij, pa tudi z mrežnim delovanjem podpornega okolja (izobraževalno-raziskovalne ustanove, kmetijska svetovalna služba).

Ključne besede

EIP-AGRI operativne skupine, kmetijske inovacije, večdeležniški projekti, inovacijske in kmetijske politike



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1 Introduction

In year 2012 an initiative European innovation partnership for agricultural productivity and sustainability (EIP-AGRI) was launched as part of the Rural Development Programme in several member states. The core idea was to catalyse innovations that “achieve more and better with less” (Eckerberg et al., 2023) to make European agriculture and forestry more resilient, sustainable and competitive and to upgrade the previously identified modest innovation and knowledge exchange in agricultural sector. The EIP-AGRI is one of five European Innovative Partnerships that was introduced to boost EU’s capacity to innovate. It aims at improved coordination of public innovation measures and mechanisms, strengthening the bridges between research and practical farming, and encouraging the exchange of practices at EU level. For the programming period 2023–2027 the Common Agricultural Policy (CAP) confirmed this intervention as the preferred strategic initiative for accelerating innovation and knowledge sharing. For the implementation of EIP-AGRI the key interface is operational group (OG) (Cristiano & Proietti, 2018) which can be defined as complex partnership being set-up and involved in projects designed to respond to farmers’ problems or generate opportunities in the sector through innovation. More than 3,800 OGs have completed their activities, funded by 98 rural development programmes across 26 European Union member states (European CAP Network, 2024).

In the context of European agricultural policies, EIP-AGRI and its OGs are considered as part of the agricultural knowledge and innovation system (AKIS), which is described as »a system of innovation, with emphasis on the organizations involved, the links and interactions between them, the institutional infrastructure with its incentives and budget mechanisms« (SKP Slovenije. AKIS, 2024). The implementation of EIP-AGRI with its OGs is grounded on »interactive approach« which is evaluated to be most effective way of generating and disseminating innovative solutions to farms and rural territories. Within this approach, the interventions are carried out by a diverse group of actors, including farmers, advisors, researchers, processing industries, and others (e.g. educational institutions, producers’ groups, etc.) directly involved in identifying, developing and adopting specific innovative solutions. Support is therefore given to OGs to promote co-creation and bottom-up approaches to innovative solutions while fitting the needs of farmers and rural entrepreneurs (Eckerberg et al., 2023).

In Slovenia, national public institutions allocated more than 18,2 million euros to the implementation of 67 Operational group projects (SKP Slovenije, EIP seznam projektov, 2024). Broader analysis of the EIP delivery in Slovenia has not been performed yet. In general, the literature on the interactive approach in the context of EIP-AGRI is still limited, both on national and international level due to the fact that the intervention has only been recently implemented and consequently the modest data available (Arzeni et al., 2023; Fieldsend et al., 2021). It is evident that broader data on the implementation of OGs, multi-actor-related experiences and, more importantly, the assessment of OGs that have conducted the projects, possible hierarchies in these partnerships, etc. is still lacking. On the other hand, more analyses on similar interactive approach being implemented in the delivery of LEADER/CLLD (community-led local development) was conducted: the later was introduced as pilot incentive in 1991, and became a mainstream intervention within the CAP in 2007–2013 programming period since more data is available and a longer period could be monitored and evaluated (Potočnik Slavič et al., 2022).

This article presents the initial study on Slovenian OGs, focusing primarily on the networks, financial aspects and thematic priorities. We proceed by introducing our analytical framework, followed by a description of the data and methods applied. We worked on two research questions.

- The first question examines which actors and stakeholders were involved in OGs implementation and in which rural territories they were active. We expected to identify certain regional rural clusters with bigger concentration of interactive partnerships and networks.
- The second question indicates and elaborates the thematic areas in which innovation and knowledge exchange occurred within the OGs. We anticipated that more innovation (in technical and in social sense) and environmental and climate-related goals are given high priority with the OGs in the EIP- AGRI delivery in Slovenia.

2 Methodology

The data used to answer our research questions were obtained from the EIP-AGRI database at the Slovenian Agency for Agricultural Markets and Rural Development. This database contains information on all funded Operational Groups (OGs) in Slovenia during the period 2018–2024, specifically under Measure M16 – Cooperation. The data were received in October 2024. The dataset includes the project title, name of the lead partner and project partners, project status (completed or ongoing), percentage of co-financing and own contribution, total approved project value and funding distribution among partners, officially reported thematic areas (if available), project objectives and aim, and additional links to results and publicly available project materials.

Two methodological approaches were applied: stakeholder analysis and content analysis. First, a content analysis was conducted to systematically group the 20 official thematic areas into 12 broader categories. Since the official classification proved insufficient - either because beneficiaries did not report it or because projects applied multiple thematic areas, each project was categorized into up to three thematic areas based on its stated aims and objectives. A sunburst chart was created to visually represent these thematic areas and their relationships.

Second, the structure of OGs and partnerships within EIP-AGRI projects was analyzed to identify patterns of stakeholder networks. The location of each actor was determined through extensive searches of publicly available data on postal addresses found online. These addresses were georeferenced, and GIS was used to map the geographic distribution of actors across Slovenia. The locations were mapped with postal-address level accuracy. To visualize spatial patterns and stakeholder distribution, ArcGIS Pro was used for the final mapping and layout. In cases where symbols overlap occurred – particularly in the areas with a high concentration of actors – the “Disperse Markers” tool in ArcGIS Pro was applied, setting a minimum distance between symbols, in order to enhance readability and avoid excessive overlap. Differentiation was made based on the number of projects (OGs) each entity participated in, their role in the project (lead partner vs. project partner), organizational-legal type, and the amount of funding received. Findings emerged from the analysis of maps and visualised data in graphs.

3 Results

EIP-AGRI projects in Slovenia as a part of European approach to promoting innovation and collaboration in agriculture and the sustainable development of rural areas, have been implemented since 2018. The aim of these projects is to establish connections among various stakeholders – from farmers, advisory services, researchers, universities, businesses, to non-governmental organizations – to find efficient and effective solutions to challenges in agriculture and the environment.

3.1 Spatial distribution of financed EIP projects reflects regional disparities

In the period 2018–2024, a total of 67 EIP-AGRI projects of operational groups were implemented (finished or on-going), involving 770 project partners. Among them, 445 different actors and stakeholders' entities from Slovenia participated, with 101 of them being involved in at least two projects. The spatial distribution of project partners and leaders of EIP projects in Slovenia is shown on the map below (figure 1), where the legend also indicates the number of projects they have participated in so far.

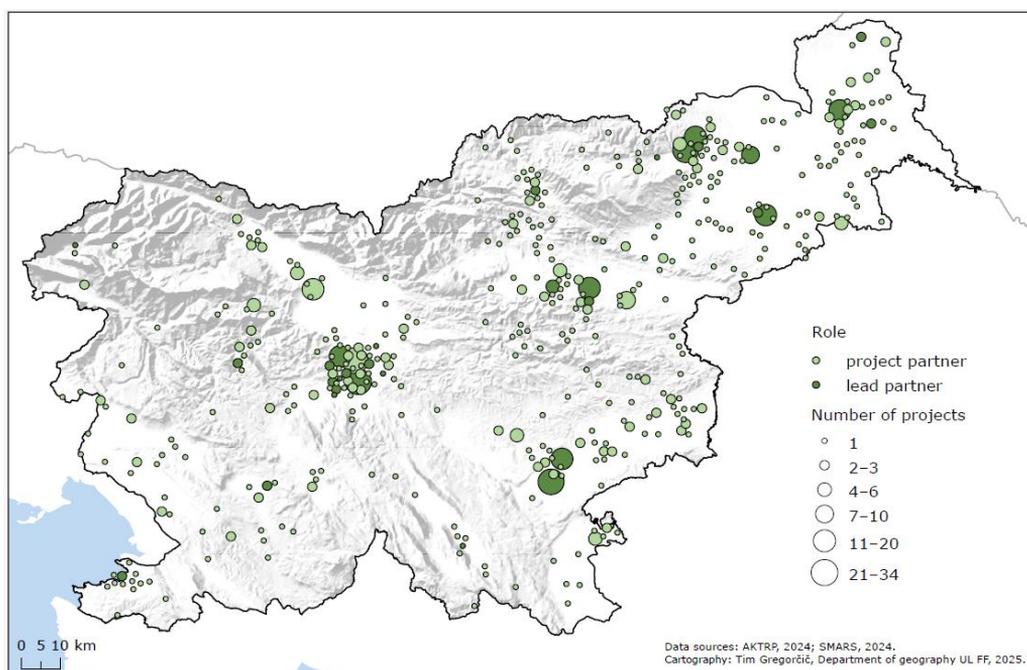


Figure 1: Spatial distribution of lead and project partners participating in EIP-AGRI projects in Slovenia, categorized by the number of projects they have been involved in.

Source: Authors, 2025.

This spatial distribution underscores regional disparities in participation, with central and eastern regions playing a dominant role. Regions with intensive agricultural activities, such as northeastern Slovenia (Pomurje and Podravje), tend to have a higher concentration of EIP-AGRI projects. A significant number of EIP-AGRI projects are also located in the Dolenjska, Posavje, and Savinja regions. These regions also

have strong ties to regional public advisory services branches, organised within the Chamber of Agriculture and Forestry of Slovenia, and regional educational institutions, which likely facilitate their participation in EIP projects and taking the lead role. These regions often serve as testing grounds for innovative approaches in smaller-scale or family farming systems, which are prevalent in Slovenia. Their involvement demonstrates that EIP-AGRI projects are not only concentrated in the largest agricultural hubs (Pomurje and Podravje) but are also addressing the needs of diverse farming systems across the country. Certain regions, particularly in western parts of Slovenia, demonstrate fewer projects and stakeholder participation, suggesting regional disparities in farming landscape, access to funding, advisory services, or networks for engaging in EIP-AGRI projects.

A notable clustering of project partners from Ljubljana reflects the capital's role as a key administrative, research, and innovation center, also in agriculture. The presence of national funding bodies, research institutions, and universities in Ljubljana provides an institutional backbone for EIP-AGRI projects. The city also serves as a networking hub, where diverse stakeholders from academia, industry, and policymaking converge, fostering cross-sectoral collaboration in EIP-AGRI initiatives. This centralization also suggests that access to funding, knowledge, and research infrastructure plays a crucial role in shaping the spatial distribution of EIP-AGRI projects.

3.2 EIP projects reflect multi-actor participation

3.2.1 Numerous actors with limited influence

Farms are the most frequently involved stakeholders in EIP-AGRI projects, representing 42% (figure 2) of all partners, which highlights their significant presence in these collaborative initiatives. Rather than leading innovation processes, farms typically adopt, implement, and validate innovations developed by other stakeholders, such as public research and educational agricultural institutions, public agricultural advisors organised within Chamber of Agriculture and Forestry of Slovenia (CAFS), and private companies. In EIP-AGRI projects in Slovenia, farms often participate through minor activities, focusing on demonstration roles where they test and showcase new practices or technologies on their premises. Their involvement ensures that project results are rooted in practical agricultural contexts, making innovations more likely to be accepted and integrated into everyday farming practices. However, this follower role can also limit the potential for farms to shape the direction of projects actively. Their participation often depends on external guidance from more prominent stakeholders, such as research institutions or advisors, which may reduce their influence on setting priorities or co-designing solutions that directly address their unique challenges. The advantage, however, is that participation in OG projects increases their visibility and networking opportunities, fostering collaboration with researchers, advisors, and other farmers. This exposure can, in turn, stimulate investment and innovation cycles on farms, encouraging farmers to experiment with new approaches and integrate modern solutions into their production processes. By gaining early access to innovations and being part of knowledge-sharing networks, farms may improve their decision-making capacity, enhance their competitiveness and resilience in a rapidly evolving agricultural sector.

Limited liability companies (LLCs), with a 13% share of participation in EIP-AGRI projects, emerge as another key partners in these initiatives, reflecting their critical

role in bridging innovation with practical application. Their importance lies in their ability to act as intermediaries between research outputs and market-ready solutions, contributing expertise, technology, and business acumen that are essential for the successful implementation of project objectives. One of the primary strengths of LLCs in EIP projects is their capacity for commercializing innovations. These companies often bring advanced technological solutions, such as precision farming tools, digital platforms, or sustainable production techniques, and have the means to scale these innovations beyond pilot projects into broader market adoption. Their participation often complements the technical expertise of research institutions and the practical knowledge of farmers, creating a dynamic collaboration that accelerates the pace of innovation. LLCs also play a pivotal role in fostering public-private partnerships, aligning business interests with publicly resound goals such as sustainability, climate resilience, and biodiversity preservation.

However, the significant presence of LLCs in EIP projects also highlights the need for careful consideration of power dynamics. As private entities, their priorities may sometimes lean towards individual profit-driven goals, which could overshadow broader environmental or social objectives. Given that EIP projects are largely financed through public funds, it is crucial to ensure that these resources serve collective interests rather than being disproportionately leveraged for private gain. These should be understood as a principled warning about a potential risk.

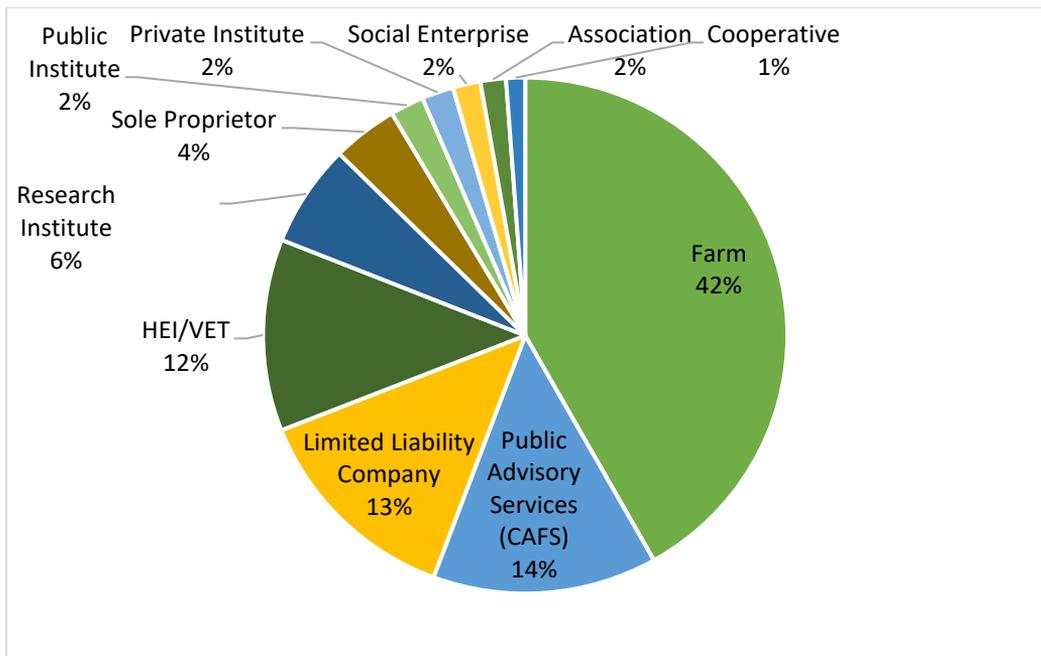


Figure 2: Share of different stakeholders participating in EIP-AGRI projects in Slovenia.

Source: Authors' calculations based on EIP-AGRI beneficiaries' data provided by AKTRP RS, 2024.

3.2.2 Significant role of public institutions: sector-representative, research and education

Educational and research stakeholders play a pivotal role in EIP-AGRI projects in Slovenia, with HEI/VET institutions (12%), public research institutions (6%) and the Chamber of Agriculture and Forestry of Slovenia with its advisory services (14%) collectively representing a significant portion of partnerships and funds (figure 2). These stakeholders are essential for driving innovation, providing expertise, and ensuring the alignment of projects with broader scientific, educational, agricultural and rural development goals. The University of Ljubljana and the University of Maribor play prominent roles, and the Agricultural Institute of Slovenia is a key partner in numerous projects. Several secondary and higher education and VET biotechnical centers have also been recognized as important regional project leaders. Research institutes contribute to EIP-AGRI projects through their scientific expertise and cutting-edge research. They are often the primary developers of innovative technologies, practices, and methodologies that address complex agricultural and environmental challenges. By conducting rigorous research and offering evidence-based solutions, these institutes lay the groundwork for project outcomes that are both innovative and scientifically validated. The Chamber of Agriculture and Forestry of Slovenia serves as a key intermediary between the research community and practitioners, particularly farmers and agricultural enterprises. Its role includes disseminating knowledge, providing advisory services, and ensuring that project outcomes are practical and applicable in real-world agricultural settings. The Chamber's involvement also facilitates stakeholder engagement and ensures that projects are responsive to the needs of the farming community, making it a vital player in bridging the gap between innovation and implementation. Higher Education Institutions (HEIs) and Vocational Education and Training (VET) institutions play a dual role in research and knowledge transfer. HEIs contribute through academic expertise, training future professionals, and conducting applied research. Meanwhile, VET institutions focus on skill development and equipping practitioners with practical knowledge to adopt and implement innovative practices. Together, these institutions ensure that the agricultural sector is not only equipped with the latest innovations but also has the capacity to use them effectively. These stakeholders' centrality to EIP-AGRI projects underscores their importance as knowledge generators and disseminators, ensuring that project outcomes are both innovative and applicable. Their presence also ensures that the projects align with long-term sustainability goals, as they contribute to capacity building and the education of a skilled workforce.

3.2.3 Visible role of other relevant actors

In addition to farms, educational and research institutions, and companies, EIP-AGRI projects in Slovenia also involve a range of smaller (less than 5%), but significant partners who contribute to the multi-actor landscape of the EIP-AGRI initiatives: social enterprises, private and public institutes, sole entrepreneurs, different associations and cooperatives.

The central region, which includes Ljubljana (figure 3), stands out for hosting several key stakeholders such as HEI/VET institutions and research centres with key actors University of Ljubljana and Agricultural Research Institute, public advisory services (CAFS – Ljubljana) and private companies, reflecting the administrative and organizational importance of the capital region. Maribor as a regional centre, with its university and other institutions, serves as another significant research hub and a key

contributor to EIP-AGRI projects in Slovenia. However, the role of secondary agricultural schools and vocational education and training (VET) institutions located in more rural areas, such as Novo mesto, Naklo, Šentjur, and Žalec, is also significant. The regional branches of the Chamber of Agriculture and Forestry of Slovenia play a crucial role as key partners and sometimes leaders in EIP-AGRI projects. These branches serve as vital intermediaries between research institutions, policymakers, and farmers, ensuring that innovative solutions developed within projects are effectively communicated and implemented at the local level. Their strong regional presence allows them to address the specific needs and challenges of diverse agricultural areas across Slovenia, making them indispensable for the success of these projects.

Collaboration between educational centres and regional agricultural advisory services has proven to be particularly effective. When VET institutions or secondary schools are closely connected with regional advisory services, the synergy enhances the frequency, quality and impact of EIP-AGRI projects. Advisory services provide practical knowledge and direct links to farmers, while educational institutions contribute training, innovation infrastructure, and a younger generation of skilled agricultural professionals.

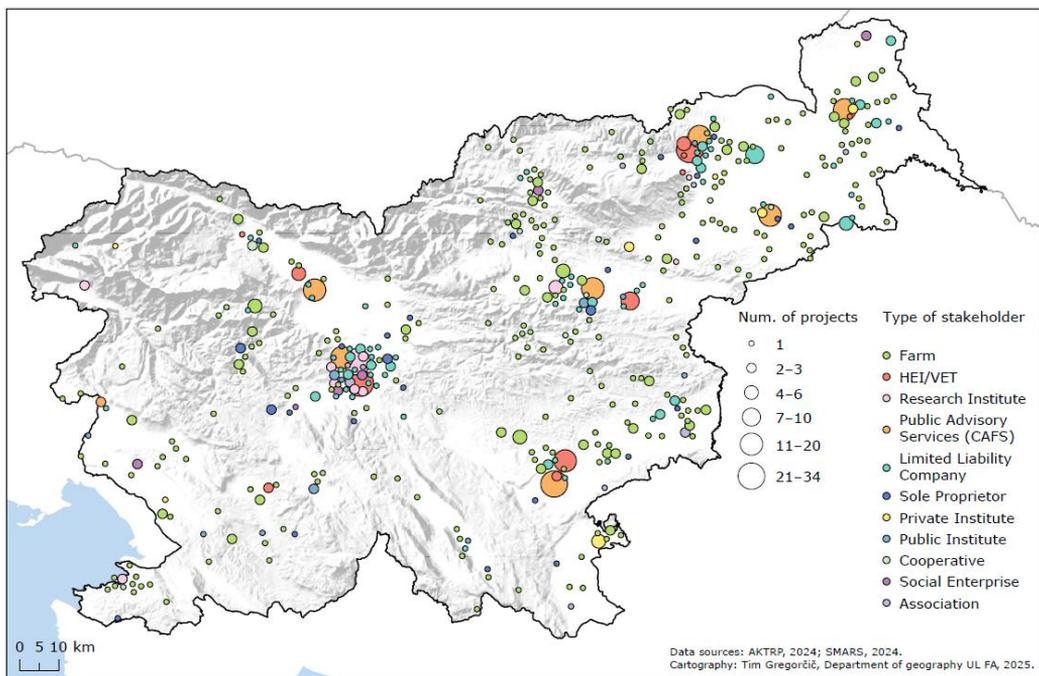


Figure 3: Spatial distribution of stakeholders, categorized by the number of projects they have been involved in and by their type (legal-organizational form).
Source: Authors, 2025.

3.3 Prevailing thematic areas of EIP projects

3.3.1 Official categorization of thematic areas: following contemporary administrative priorities

Official data on EIP-AGRI OG projects in Slovenia indicate that 67 projects cover 20 thematic areas, reflecting the diverse challenges and opportunities within the agricultural sector. These areas address topics ranging from environmental conservation and climate resilience to technological advancements and sustainable resource management, showcasing the comprehensive approach of EIP-AGRI initiatives in fostering innovation and collaboration.

To streamline the analysis, certain thematic areas were logically grouped into 12 categories, as shown in the figure 4. The largest share of EIP-AGRI projects in Slovenia focuses on agriculture as a support for nature conservation and biodiversity preservation, with 8 projects conducted in this area (e.g. pollinator-friendly farming, traditional meadow orchards, management of conservation-important grasslands). The second largest category, with 6 projects, involves mitigating and adapting to climate change on agricultural holdings (e.g. climate-resilient crop production with new crops such as industrial hemp and forage crop, climate-smart farming, ecosystem services).

In the area of sustainable water use, aiming to reduce surface and underground water pollution and adapt to water protection zones, 5 projects have been implemented (e.g. sustainable agriculture in river riparian zones, sustainable irrigation water use). Four projects address sustainable soil use, focusing on soil fertility preservation, erosion prevention, and soil degradation mitigation, as well as sustainable crop protection. Another 4 projects are dedicated to the rearing of high-quality small ruminants and cattle, including the introduction of genomic selection. Other significant areas include high-performance sustainable production of apples, grapes, and vegetables (4 projects), local food supply systems (3 projects), digitization of agricultural holdings (3 projects), and protein crop production technologies (2 projects). In the field of efficient energy use and renewable energy sources in agriculture, one project has been implemented. Furthermore, more than one-third of the projects either addressed multiple thematic areas (13 projects) or lacked a clearly defined thematic focus (14 projects), making their classification challenging.

In the application process for Slovenian EIP-AGRI, applicants are required to specify the OG thematic areas. Similar to the Swedish EIP-AGRI delivery (Eckerberg et al., 2023) we found that thematic prioritization is determined at the administrative level through the application and selection process.

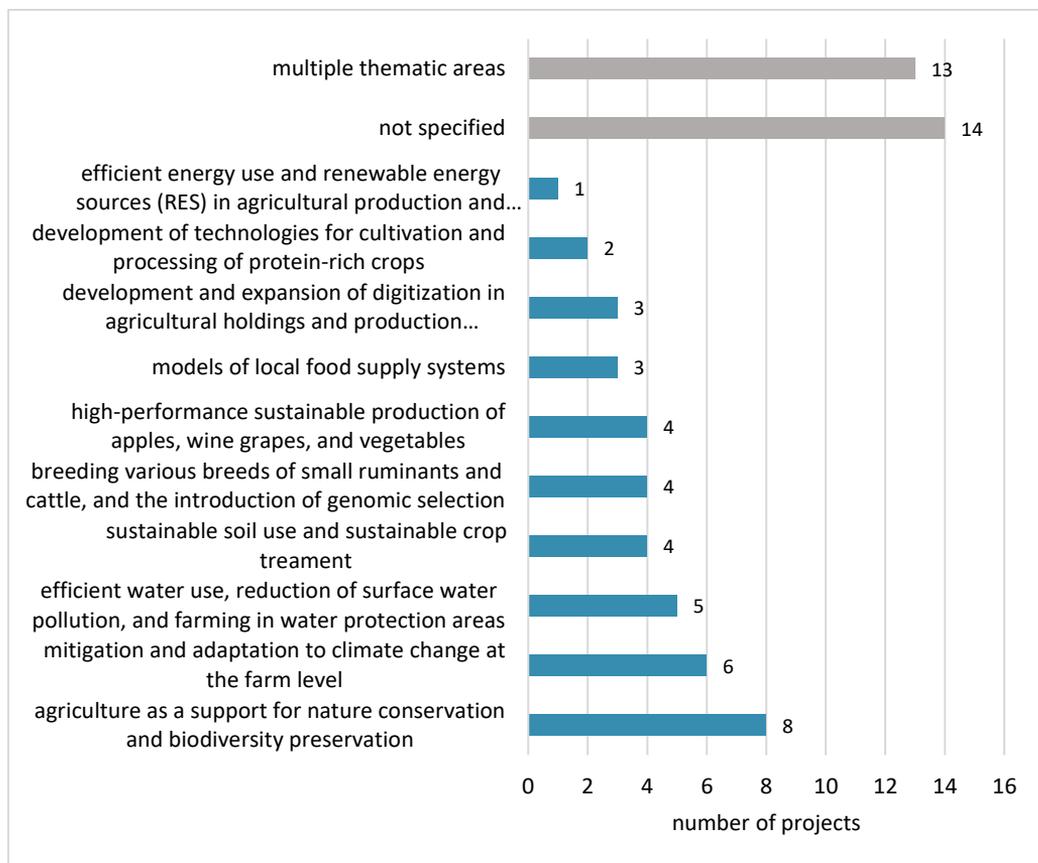


Figure 4: Distribution of EIP-AGRI projects in Slovenia by official thematic areas. Source: Authors' calculations based on EIP-AGRI beneficiaries' data provided by AKTRP RS, 2024.

3.3.2 Bridging horizontal and sector-specific thematic areas

Since the official classification of thematic areas for EIP-AGRI projects in Slovenia proved to be insufficient and since projects are often addressing multiple thematic areas, we categorized each EIP-AGRI project into up to three thematic areas. We found that 28 projects (26%) partially or fully address the development of new technologies for production (table 1), processing, and breeding, while approximately one-quarter of the projects focus on agriculture as a support for nature conservation and biodiversity preservation. A total of 18 projects partially or fully address climate change mitigation and adaptation. Additionally, 16 projects (15% of all projects) target sustainable management of water and soil. Other areas include: 12 projects (11%) focusing on precision farming and digitalization, 7 projects are addressing local food supply models, and 5 projects are dedicated to sustainable energy use and the circular economy.

Table 1: Categorization of EIP-AGRI projects in Slovenia by thematic areas (up to three categories per project).

Source: Authors' calculations based on EIP-AGRI beneficiaries' data provided by AKTRP RS, 2024.

Thematic area	Number of projects	Share (%)
New technologies for production, processing and breeding	28	26
Nature conservation and biodiversity	23	21
Climate change mitigation and adaptation	18	16
Sustainable management of water and soil	16	15
Precision farming and digitalization	12	11
Local food supply models	7	6
Sustainable energy use and circular economy	5	5

The comprehensive hierarchical representation of EIP-AGRI projects in Slovenia with sunburst chart (figure 5), which present main thematic areas and subcategories to reflect their multidimensional nature and focus, shows that new production, processing, and breeding technologies represent an important component of numerous EIP-AGRI projects, however, it does not dominate as a central thematic focus. While new technologies play a crucial role in supporting various project objectives, their presence is often integrated into broader themes rather than serving as the primary focus of the EIP projects.

Mitigation and adaptation to climate change emerge as significant themes, with projects addressing mitigation (three projects) and adaptation (five projects) prominently, these efforts are complemented by projects focusing on climate-adapted crops (two projects) and biodiversity and nature conservation (two projects), highlighting an integrated approach to enhancing climate resilience while protecting ecosystems. Additional contributions to this theme include new technologies (three projects) and digitalization (one project), showcasing the role of innovation. Moreover, climate change is also a recurring subtheme in several other areas, such as sustainable management of water and soil, biodiversity and nature conservation, precision farming and digitalization, demonstrating its cross-cutting significance and the interconnected nature of these projects.

Among EIP-AGRI projects in Slovenia, similarly represented are the themes of nature conservation, biodiversity and ecosystem services, precision farming and digitalization in agriculture, sustainable management of water and soil, with subtopics water quality and soil conservation, and different projects, focused on development of new technologies for production, processing and breeding. Fewer projects, however, focus on themes such as local food supply models and sustainable energy use and the circular economy. While these areas are less represented, they remain important components of the overall framework, contributing to localized solutions and energy efficiency within the broader context of agricultural sustainability.



Figure 5: Hierarchical representation of thematic areas and subcategories in EIP-AGRI projects in Slovenia.

Source: Authors' analysis and visualisation based on EIP-AGRI beneficiaries' data provided by AKTRP RS, 2024.

3.4 Funding Allocation Disparities

The allocation of funding within EIP-AGRI projects reveals distinct patterns regarding the primary beneficiaries and their roles in fostering agricultural innovation. Between 2018 and 2024, a total of 67 EIP-AGRI projects or operational groups have a combined value of 18.2 million € (AKTRP, 2024). The average approved project value is 271,331 €. EIP-AGRI projects are co-financed by the European Agricultural Fund for Rural Development (EARDF). The average co-financing rate was 89%, with funding ranging from 59% (9 projects) to fully funded projects (26 projects).

The funding distribution indicates a strong collaboration between academia, private enterprises, and public advisory institutions. Among the key beneficiaries, higher education and vocational training institutions (HEI/VET) received the largest share of funding (€4.24 million €) underscoring the EIP-AGRI emphasis on research, knowledge transfer, and the development of innovative agricultural practices. The second-largest beneficiaries were limited liability companies (LLCs), securing €3.7 million, which accounts for 18% of all allocated EIP-AGRI funds in Slovenia. This high share of funding for LLCs signals an ongoing trend towards privatization in the agricultural innovation sector, where private companies increasingly influence

research agendas and technological advancements. Given that EIP-AGRI projects are primarily financed through public funds, it is essential to ensure that these resources serve collective agricultural and societal needs rather than being disproportionately leveraged for private gain.

The Chamber of Agriculture and Forestry (CAFS) as the main agricultural advisory institution in Slovenia, with a public status, received 2.62 million €, underscoring its key role in advisory services for farmers, farmers support and policy implementation. Agricultural research institutes (one large public and several smaller research institutes) were allocated 1.91 million €. A diverse range of smaller actors, such as social enterprises, cooperatives, public institutes, and associations, have collectively received less than 13% of total EIP-AGRI funding in Slovenia. This highlights a concentration of financial resources among a few dominant players (academia, private companies and public advisory institutions), while smaller organizations may face challenges in accessing funding despite their potential contributions to innovation and sustainability. Farmers, despite their strong presence, received only 18% of total EIP-AGRI funding (figure 6). Strengthening the role of farms as co-creators of innovation, rather than just followers or demonstrators, could enhance their engagement and ensure that EIP-AGRI projects deliver solutions that are both practical and tailored to the realities of diverse farming systems.

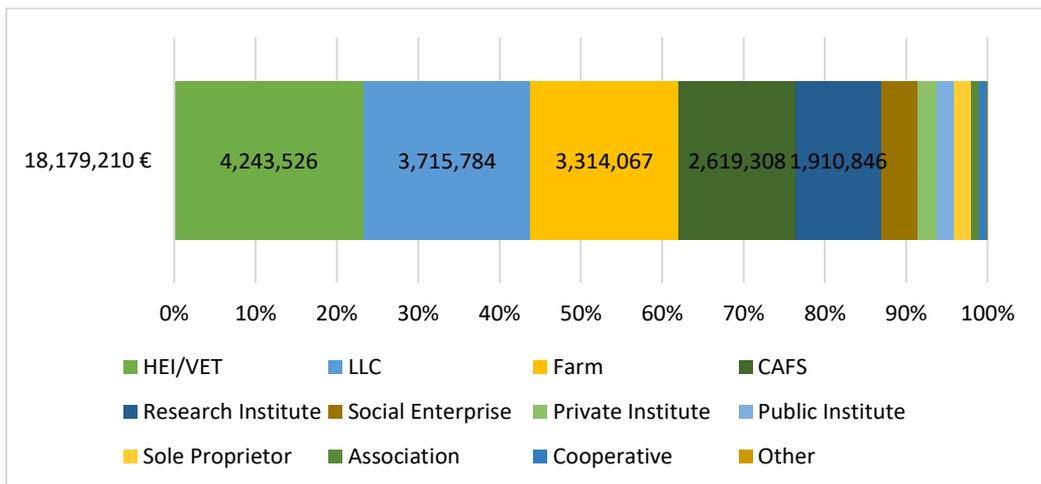


Figure 6: Funding allocation of EIP-AGRI by stakeholders' type.

Source: Authors' calculations based on EIP-AGRI beneficiaries' data provided by AKTRP RS, 2024.

4 Conclusion

It is evident that in the EIP-AGRI the linear approach to innovation persists (EU SCAR, 2012), transferring research knowledge between mainly public education and research institutions, public advisory services and farmers. The high share of funding allocated to limited liability companies (LLCs) also indicates a strengthening role of private companies in EU-supported agricultural innovation, reflecting a shift towards increased private sector involvement in agricultural innovation landscape. Farmers are acting mainly as followers, demonstrators, or test sites for new solutions rather than as active contributors to innovation co-creation. Strengthening the role of farms as co-creators of innovation, rather than just followers or demonstrators, could enhance

their engagement and ensure that EIP-AGRI projects deliver solutions that are both practical and tailored to the realities of diverse farming systems. Given the recognition that farmers often learn from other farmers, highlighting importance of peer-to-peer learning (Koutsouris et al., 2017), more attention should be given to ensuring that farms are recognized as equal partners within the EIP-AGRI framework — both in terms of decision-making and financial allocation—while also reducing administrative burdens associated with the ‘projectification’.

The delivery of EIP-AGRI OGs in Slovenia appears to have progressed relatively swiftly, with comparatively limited emphasis on clearly communicating the purpose and opportunities of the EU initiative. As a result, access to these funds and participation in the projects was more prominent among a narrower group of actors and stakeholders, while some potential beneficiaries – particularly those less embedded in formal agricultural networks, may have been left out due to a lack of information or support. Fieldsend et al., 2021 proposed that to engage harder-to-reach groups may require the establishment of community-level knowledge brokering hubs could provide a solution. In Slovenia, this role could be fulfilled by Local Action Groups (Potočnik Slavič et al., 2022), which at least to some extents are already performing such a bridging and support function in regions where formal agricultural support structures are weaker or less accessible.

Thematic priorities in Slovenian EIP-AGRI projects are diverse, yet environmental issues dominate. In total, more than half of all EIP-AGRI projects address climate change as a significant secondary goal, demonstrating the importance of climate-related objectives across various thematic areas in Slovenia's agricultural innovation landscape. But less than 10 % of projects were identified as directly focused on climate change mitigation and adaptation. Surrounding this core, there are additional environmental supportive thematic areas that contribute to it, namely biodiversity conservation, soil health, and water resource efficiency. However, it raises questions about the actual impact of funded projects on climate and environmental improvements.

The extent to which these projects have effectively contributed to knowledge exchange, innovation creation and adoption, increased competitiveness and climate resilience (Kralj, 2024) remains unclear based on the available data. A comprehensive assessment of their actual impact would require extensive fieldwork and qualitative research, including evaluations of how well environmental issues were addressed and the broader impacts of funded initiatives. While some pilot studies have provided initial insights, a more systematic approach is needed to fully understand the outcomes and long-term benefits of EIP-AGRI. Additionally, it would be valuable to explore synergies with other programmes within the innovation landscape: LEADER/CLLD, LIFE, Horizon, Erasmus, INTERREG, informal co-innovation networks, etc.

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Povzetek

V okviru EIP-AGRI operativnih skupin v Sloveniji še vedno prevladuje linearen pristop k inovacijam, kjer se znanje prenaša med tremi ključnimi akterji: javnimi raziskovalnimi in izobraževalnimi ustanovami, javno kmetijsko svetovalno službo in kmeti. Kmetje v projektih pogosto nastopajo kot sledilci, demonstratorji ali zgolj preizkuševalci rešitev, namesto da bi sodelovali kot enakovredni sooblikovalci inovacij. Krepitev njihove vloge v inovacijskem procesu bi lahko izboljšala aktivno vključevanje in zagotovila rešitve, prilagojene dejanskim potrebam slovenskih kmetij. Še posebej ob dejstvu, da kmetje vrednotijo kot ključno učenje med kmeti, torej drug od drugega, kar pa zahteva priznavanje kmetov kot enakovrednih partnerjev v EIP-AGRI projektih ter razbremenitev administrativnih ovir, povezanih s projektno logiko izvajanja, ki jim je mogoče tuja.

Povečan delež finančnih sredstev, dodeljenih družbam z omejeno odgovornostjo, nakazuje na krepitev vloge zasebnega sektorja v EU podprtih kmetijskih inovacijah in premik k večji vključenosti tržnih akterjev. Nekateri akterji in deležniki pa so še vedno slabo zastopani v EIP-AGRI projektih, npr. različna društva, združenja, zadruge, socialna podjetja, javni zavodi itd. V Sloveniji se je izvajanje EIP-AGRI operativnih skupin začelo dokaj hitro po letu 2018, vendar s pomanjkljivim komuniciranjem namenov in priložnosti te pobude. Tako so imeli v prvih letih dostop do sredstev predvsem deležniki z dobrimi informacijskimi kanali in izkušnjami v kmetijskem sektorju, medtem ko so bili drugi – zlasti tisti izven formalnih mrež – pogosto izključeni. Ena izmed možnih rešitev za vključevanje težje dosegljivih skupin oz. akterjev na podeželju so lokalne posredniške točke znanja in informacij. V slovenskem prostoru bi to vlogo lahko še okrepile lokalne akcijske skupine (LAS), ki že opravljajo podporne funkcije v okoljih z omejenim dostopom do formalnih institucij. Večja zgostitev EIP-AGRI projektov je v vzhodni in osrednji Sloveniji, kar je povezano z vlogo kmetijstva, številom kmetij, pa tudi z mrežnim delovanjem podpornega okolja.

Tematska raznolikost slovenskih EIP-AGRI projektov je velika. Prevladujejo okoljske vsebine. Več kot polovica projektov obravnava podnebne spremembe kot spremljevalno temo. Vendar jih je manj kot 10 % neposredno usmerjenih v blaženje ali prilagajanje. Pojavljajo se tudi teme, kot so ohranjanje biotske raznovrstnosti, zdravje tal in učinkovita raba vodnih virov. Kljub temu pa ostajajo vprašanja o dejanskem učinku EIP-AGRI projektov. Za celovito oceno učinkov bi bila potrebna poglobljena terenska raziskava, vključno z evalvacijo rezultatov in iskanjem sinergij z drugimi programi razvoja podeželja in inovacij (npr. LEADER/CLLD, LIFE, Horizon, Erasmus, INTERREG itd.).

Characteristics of Rural Architectural Housing Typologies in Doukkala area, Morocco

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Abstract

Doukkala, located in central Morocco, features diverse rural architecture shaped by nine tribes according to local resources and traditions. This article explores the transition from traditional to modern housing, highlighting differences in form, construction methods, materials, and functions, as well as challenges faced by rural dwellings. It also examines state efforts to preserve and valorize traditional housing as cultural heritage. The study applies a descriptive and historical approach, combining field research, scientific literature, and terrain observation using ArcGIS and satellite imagery to analyze rural housing typologies in the Doukkala region.

Keywords

Doukkala, Architecture, Rural housing, Tazota housing, urban transformation.

Izveleček

Značilnosti tipologij podeželske arhitekture na območju Doukkala v Maroku

Doukkala, regija v osrednjem Maroku, je znana po raznoliki podeželski arhitekturi, ki so jo oblikovala plemena glede na dosegljivost lokalnih virov in tradicijo. Prispevek raziskuje prehod od tradicionalnih k sodobnim oblikam bivališč ter izpostavlja razlike v obliki, gradbenih metodah, materialih in funkcijah, pa tudi izzive, s katerimi se soočajo podeželska naselja. Obravnava tudi prizadevanja države za ohranitev in ovrednotenje tradicionalnih bivališč kot kulturne dediščine. Študija uporablja opisni in zgodovinski pristop ter združuje terensko raziskovanje, pregled znanstvene literature in opazovanje terena s pomočjo programske opreme ArcGIS in satelitskih posnetkov za analizo tipologij podeželskih bivališč v regiji Doukkala.

Ključne besede

Doukkala, arhitektura, podeželska bivališča, bivališča tipa Tazota, urbane spremembe



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1 Introduction

The local population has interacted with the natural environment of Doukkala area according to the adequate conditions, as it has built various architectural rural housing beginning with nomadic housing like the Noala and the Tazota housing. These housing typologies constitute a material heritage. The local population has built and created various architectural rural housing drawing on cement, iron and bricks. It has adopted the container housing according to the economic and social conditions.

The architectural rural housing has become a principal element of the capital material. Doukkala is well known by the diversity of architectural housing typologies according to the geometric and material methods of construction. Doukkala is characterized by ancient traditional housing such as the Noala, the Toufri, and the Tazota. However, it is also characterised by modern housing built with bricks, iron, and cement.

This study focuses on characteristics of rural architectural housing typologies in the area of Doukkala due to the shortage of studies on rural housing. That is, the topic under study is being addressed only by one study that is entitled as " Endangered building cultures in Morocco: the case of Tazota in Doukkala region" by the researchers Samia Nakkouch and Mohamed Filali (2025). However, the study did not tackle all typologies of architectural rural housing in Doukkala area. In other words, the subject has not received important studies regarding types, characteristics, and function of housing across Doukkala. Our study can be considered as a fundamental foundation for local researchers who are interested in rural housing.

1.2 Research problem and objectives of the study

Doukkala area is located in the center of morocco. Doukkala is characterized by semi-arid climate and is known by agricultural irrigation drawing on Oum Errabia valley. In Bour subsistence agriculture depends on precipitation while the agricultural in general depends on wells. The local population has interacted with the local environment of Doukkala and has created various architectural rural housing typologies that differ according to the geometry, function, materials, and economic and social status. The purpose of this study is to describe typologies of traditional and modern rural housing built by the populations of Doukkala and factors for the transition towards modern housing. It also investigates the reason behind the abandonment of traditional rural housing. Moreover, this study aims to find out the procedures of the state and the local population in preserving the heritage of traditional housing in the context of the sustainable development.

To investigate the topic, the study will take fundamental and secondary questions. The main question of this research is "what are the architectural rural housing typologies and the factors behind the shift from traditional to modern housing in the area of Doukkala?" whereas the secondary questions go as follows:

- What are the characteristics of the common architectural rural housing typologies in the Doukkala area?
- What are the factors behind the transition from traditional to modern housing in the rural areas of Doukkala?
- What are the procedures taken by the state to preserve and valorise traditional housing for tourist's attraction?

- What are the constraints the architectural rural housing is facing in Doukkala area?
- What is the nature of the constraints that the rural areas are facing? Are they structural, legal, or socio-economic?

2 Methodology

- Using the descriptive approach to describe architectural rural housing typologies in terms of forms, geometry, materials, function and classification of both the traditional and modern housing.
- Using the historical approach to study the traditional housing in terms of the history of construction and use by the people of Doukkala. This approach was used to study the factors which lead to the shift from traditional to modern housing in the area of Doukkala.
- Field research is a fundamental element of data collection to be adopted in our study. That is, it was necessary to contact the local population to identify the various architectural rural housing based on the geometric and materials of building. This paper absolutely draws on scientific articles indicating several types of rural houses in Doukkala.
- This paper directly draws on observing the rural housing forms. This terrain observation has been an opportunity to pick up pictures presenting the rural housing forms building by the local population. In order to produce thematic maps, the software Arc Gis 10.8 is used to process Google Earth imagery.

3 Results

3.1 Study area

Doukkala area is located in the center of Morocco. It is characterized by a semi-arid climate as it is penetrated by seasonal valleys taking its crucial source from the Rehamna plateau. Doukkala is divided into four distinct spatial units when talking about development: Oulja part is exploited with intensive agricultural irrigation relying on wells. The Sahel part is exploited in agricultural pastoralism. The plain part is exploited in irrigated agriculture drawing on Oum Errabia valley (El aoud, 2024). The part of south-eastern margins is exploited in Bour subsistence agriculture depending on precipitation. Doukkala area is inhabited by nine tribes. Doukkala is characterized by a semi-arid climate and irregular precipitation at a rate of 266 mm according to 36 years climate series (1980/1981 a 2015/2016) (El aoud, 2024).

Doukkala has got seasonal valleys taking its source from the Rehamna plateau: The Aouja, Souani, and Bouchane, etc. Doukkala is an area that belongs to Casablanca-Settat region according the territorial division of 2015 (Figure 1).

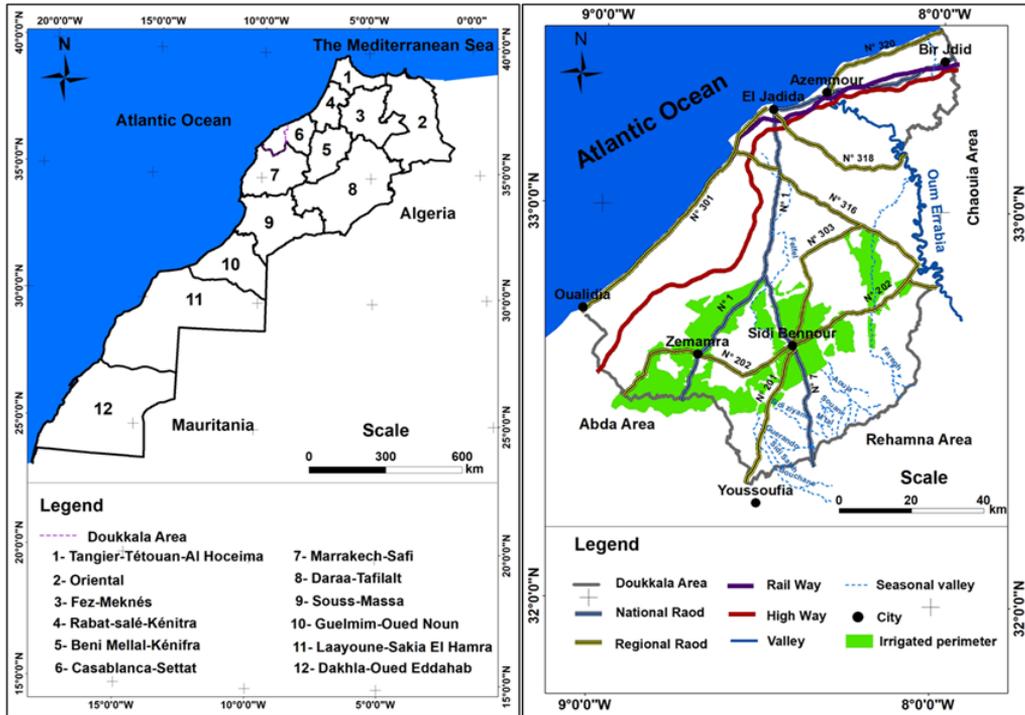


Figure 1: Doukkala as an Area in Region of Casablanca-Settat.

Source: Personal work based on Google Earth imagery, 2024 using Arc Gis 10.8 software.

Doukkala extends to 11289 km² approximately. Doukkala is divided into two provinces: El Jadida and Sidi Bennour. Doukkala is inhabited by 1.366.297 million inhabitants (R.G.P.H, 2024) and nine tribes: The Aouate, Ouled Bouzerara, Ouled Amrane, Ouled Amour, Ouled Bouaziz, Ouled Frej, The Haouzia, Chtouka, and the Chiadma (Bellaire, 1932). The tribe is a homogeneous societal unit; it is characterized by interaction at the economic, social, cultural, political and organization level. The tribe is a group of people belonging to a tribal alliance or ancestor. It consists of several clans and douars; the tribe is settled in specific geographical and unified by specific regales.

The douar (Dresch, 2018) is a distinctive residential community in rural of the Doukkala area (Figure 2). The douar is the smallest administrative unit within the territorial community or province and remains under the control of The Mkadam (is a representative of the local authorities whose function is to collect information's in the Douar or Douars s/he is being assigned).



Figure 2: The Douar is a Residential Compound "Ouled Boubkar Douar as a Model".
Source:Field work, 2024.

3.2 Definition of rural architectural, housing, and rural housing

Rural architectural is the spatial and function response to local needs, especially productive and residential, closely conditioned by the agricultural context. Thus rural housing is developed in a habitable environment conditioned to the geographical context and cultural roots, being the building itself an architectural component for the transformation of the territory. The inhabitant himself generally builds his rural dwelling to live in the countryside and engage in agricultural activities (Pena-Huaman et al., 2022). The building has a directly link with the climate the economy, the materials and construction techniques.

The housing a fundamental human right, the house is the first building created by humans, from which all others have evolved. The meaning people associate with a house is "home", it is an evolving psychological construct based on people's cultures, traditions, and personality traits. The house is first and foremost a place of connection of relationships that are foundational and life-giving (Ismail Farahat et al., 2023). The house is a place where the dwellers feel comfort into (Mousavi & Nochian, 2014).

The rural housing refers to the dwelling and residential areas located outside of cities and towns, characterized by low population density and often associated with agriculture or natural landscapes. The rural housing:

- At the level of physical characteristics, rural housing is the place occupied by buildings and their facilities; it is built from strong materials such as stones and cement or fragile materials such as reeds and wood. The rural housing takes two forms which are clustered and dispersed. The layout of rural housing varies according to the economic and social possibilities including traditional, modern or a combination of both.
- At the level of social function, the rural housing is a place for human residence in the rural setting. It is any place where one or more people can take shelter and realize all their needs such as sleeping and eating. The rural housing is a space where family decisions are made and the distributions of roles between family members take place.

- At the level of economic function, the rural housing is a space for practicing various activities such as agriculture, commerce, and industry, storage and cattle breeding.

3.3 Characteristics and Typologies of the traditional architectural rural housing in the Doukkala area

The local population has interacted to cope with the natural milieu of Doukkala, as it has built various architectural housing rural vary according to building materials, geometry, and function, and local environment, economic and human factors. This diversity has contributed to the existence of a rich variety of architectural housing: traditional rural housing built with local materials and skills associated certain time periods.

3.3.1 The Tazota housing

The name Tazota refers to an authentic dry stone building which is culturally implemented in the countryside of Doukkala (Nakkouch & Filali, 2025). The Tazota is a distinctive form of architectural traditional rural housing in the area of Doukkala. Limestone is one of the materials used in the construction of Tazota; it takes a cylindrical or square geometric form. The tazota used for human shelter, and storage, and actually the Tazota is used for tourism as an authentic and unique material heritage in the area of Doukkala.

The tazota is an ancient building its origins go back to the Roman period and was found in the Doukkala area in 15th and 16th centuries, and was associated with the Portuguese period. The Tazota in the Amazigh indicates overturned bowl (figure 3). The Tazota also refers to a place in the Middle Atlas in the vicinity of the city of Sefrou in Morocco.



Figure 3: Tazota is a Building in Doukkala Area.

Source:Field work, 2024.

The characteristics of the tazota housing vary in terms of building materials, construction, techniques, and constituent element:

- Materials and construction techniques and the elements of the tazota
- ✓ The materials
 - The stones: The limestone is one the materials used in construction. It is a rough flat oval form. The local geological characteristics helped the existence of limestone, to constitute an essential element in the rural milieu of Doukkala. The process of extraction limestone was an essential factor in purifying the agricultural exploitation from the stones to practice agricultural activity so that the extraction process of limestone contributed the emergence of the tazota housing. The abundance of limestone and the facility of extraction also contributed to the appearance of the tazota in Doukkala area.
 - Dry stone construction is an ecological and sustainable technique that requires few external materials and little energy. Dry stone remains an ecological solution for building sustainably and integrated into the paysage.
 - The straw: The earthen plaster is used in the terrace of the tazota building, and the interior of tazota. The walls are paved with clay mixed straw and the straw or the sugarcane or the reeds is used in roof sealing the vaulted of the tazota building. The reeds are used in the doors and the windows of the tazota.

- The earthen plaster: The mud mortar is compacted in the form of a layer 10 to 20 centimeters; it is used in the construction of the cover and the waterproofing of interior walls, ceilings and terraces.
- The wood: The local wood is used in the manufacture of frames as well as door and windows openings.

✓ Construction techniques

The tazota is built with limestone without the use of any soil mixture to hold or assemble the stones together and ensure the stability of the construction. The binder is replaced with pebbles in different sizes, used either as wedges at the well level or as cover above the slab. These pebbles are compacted using a mallet to ensure their stability and allow the upper layer to be superior.

Before starting the construction process of the tazota housing, the stone are extracting from the agricultural exploitation, and the stones are sorted and gathered in heaps according to size: large, medium, small. The stones biggest are placed at the base of the heaps. The tazota housing takes a square or circular form, and does not require supports or foundations in the constructions process, but a few centimetres are dug into the ground or the surface to serve the as the base for the construction of the walls.

In the first step, the lower part is built containing the entrance with the stairs, and in the second step, the upper part or the vaulted is built, that the construction of the stairs is an essential element in the construction of the upper part. The height of the lower part ranges between 2.20 and 3.00 meters, and the thickness of the walls range between 1.50 and 2.80 meters. The ceiling height of the tazota varies from 4 to 6 meters. The process of building a tazota requires "The maalem" who belongs to the area and masters the construction of the tazota and then his assistants.

The walls of tazota are built with stones vertical reaching a height of 1.80 meters maximum. The stones laid at an angle of 15° to the outside, which causes the stones to slide out of tazota in case of collapse or a fall. The thickness of the walls varies between 1.50 to 2.80 meters. This thickness decreases as the facing rises.

The vaults of tazota built in a circular form using stones slanted 15° to the outside, the height of the vaults varies between 1.60 and 1.80 meters, the thickness of the vault walls varies between 0.60 and 1.20 meters, and the vault are covered with three layers: the first of cover of stone, the second of strew, and the third dust to protect tazota from infiltration of precipitation.

✓ Tazota housing elements

The tazota housing consists of the following elements:

- The stairs: The tazota of the double truncated cone has one or two external stairs on the side leading to the terrace of the upper truncated cone to spread the agricultural products in the sun for drying. Sometimes a second staircase may start at the terrace of the lower truncated cone to climb to the summit of the vault. Each step of the stairs built with stone blocks, large stones 30 to 40 centimeters wide, 50 to 60 centimeters long, and 20 centimeters high on

average. The spaces between the stones are filled with small stones or pebbles for stability. The tazota of the simple truncated cone do not contain stairs.

- The entrance: The entrance is located in the median axis of the tazota, generally orienting or facing east or southeast. The width of entrance bottom varies between 1 and 1.20 meters, and the width of the upper base between 60 and 80 centimeters. A door is made of panelled wood and fixed on a wooden frame which is attached to the entrance. It can be fixed either on the right or left side of the entrance.
- The Windows: The tazota has two types of windows: the first is a window of at least 50×50 centimeters allowing ventilation and lighting, located into the wall of the vault and the above the lintel of the door. And the second is a window of at least 30×30 centimeters, on the side wall approximately of 1 meter above the ground level. The windows provide permanent natural ventilation inside the tazota. These windows of tazota are adapted to the climatic conditions so that tazota remains cool in summer and warm in winter.
- The niches and shelves: Inside and mid-height of the vertical wall are created niches or shelves square form with a shallow depth. Most of these niches have been created after the construction by extraction of stones from the wall. The shelves are used to store kitchen utensils and other objects.
- The tazota housing faces some constraints (figure 4) such as demolition, and absence of preservation by the local population and the state in the context of sustainable development.



Figure 4: Tazota building demolished and the absence of the preservation.
Source: Field work, 2024.

3.3.2 The Toufri housing

The Toufri (local name) is a distinctive traditional rural housing in the area of Doukkala that has a rectangular or longitudinal form. The Toufri is built 3 meters underground place at a depth of about 3 meters in the ground, composed of several spaces of

regular or irregular forms, and served by a corridor at the same underground level. A slope or steps (in the form of a staircase) allow access to the place. The limestone is one of main materials which are used in the construction of the Toufri housing. The Toufri consists of an external part built with juxtaposed limestone, sloping towards outside, leaving an entrance whose base expands at the bottom and narrows at the top. The terrace of the Toufri is covered with juxtaposed limestone stones, straw materials, and earthen plaster. The exterior part forms a cover to the lower part dug underground at a depth of 3 meters (M.H.U.A.E).

The toufri is used as a place for preservation and storage of grain and straw materials (figure 5). According to research Sergio Gnesda, who specialize in vernacular architecture that is based on the use of locally available resources to realize the needs, and reflect the local environment culture and historical context in which it was found. The toufri and tazota were built in the local environment cultural and materials by the local populations without the intervention of any architect. The toufri is signified to the conservation in Berber (Gnesda, 1996).



Figure 5: The Toufri is a building in Doukkala area.
Source:Field work, 2024.

The existence of limestone and the facility of extraction are for practicing agricultural activity. The local population has gained skills to collect stones and use them in the construction of tazota and toufri. These two juxtaposing buildings exist in the same place and rural local environment.

3.3.3 The kayma (tent) housing

The Kayma (local name) or tent (Dresch, 2018) is an old traditional housing, built of dress or cloth supported by the wooden column, ropes, pegs fixed in the ground (figure 6). The tent was used as a traditional housing for settling the local populations and the nomad in the Doukkala area. The use of the Kayma began with the arrival of Arab tribes during the 14th century to Doukkala; it remained prevalent until the beginning of the 20th century. The kayma was diffusing in all circles and tribes forming Doukkala area.

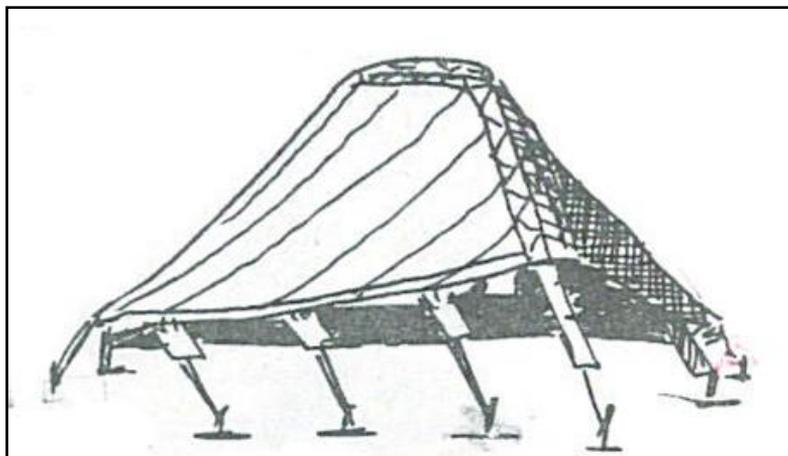


Figure 6: The Kayma Housing Form.

Source: Pascon, 1980.

The kayma housing reflects the poverty of the tribes in Doukkala area. The existence of the kayma was associated with the absence of peace. The kayma was used as a housing that helps to move in search of a safe place due to fear of the European colonists in Doukkala area. The local populations continued to use the kayma housing until the beginning of the 1940s despite the amelioration of economic and social situation. The name of the kayma is still rooted and circulated in the minds of Doukkala populations. Actually, the name of the kayma indicates the traditional housing in Doukkala area.

3.3.4 The Noala housing

The Noala (local name) is an ancient traditional housing with a spacious space covered with straw (the thatch), built within dry stone walls which allow inhabitants to defend themselves against danger. These high walls (Gotha) supported by cactus barriers (Guillaume, without a year) (it takes a circular form), could be compared to the circular military tent in the form known as "The Makhzen" comparable to the ancient Numidia "The Mbalia" that gave rise to the Berber "tent", and also comparable to the housing in Black Africa.

The Noala (Dresch, 2018) housing built with thick sugarcane that is fixed in the ground in the form of a circle, and later sewn. The Noala is covered with either reeds, hay or straw, and the Noala takes the form of a cylindrical cone, and a small door and the niches for ventilation and observation.

The Noala has diffused in Doukkala area at the beginning of the 20th century (figure 7). The 1938 census accomplished by the French protectorate authorities, confirmed the importance of the Noala existence within the housing structure in Doukkala area in the 1930s.

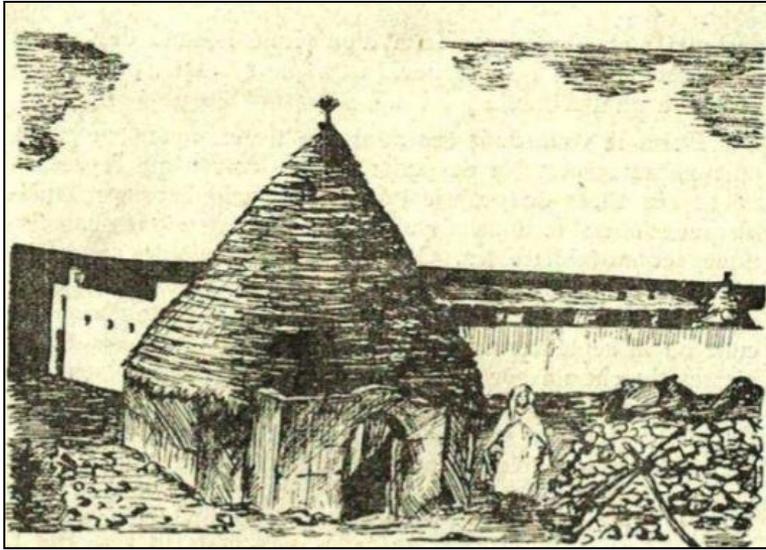


Figure 7: The Noala is Covered with the Strew (The Thatch) and Supported by the Dry Stones and Cactus.
Source: Chavent, n.d.

Actually, Doukkala area has witnessed transition in rural housing, and the function of the Noala has changed and from a housing family to housing built in agricultural exploitation for the purpose of guarding. According the terrain observation in Eastern Doukkala during 2024 (figure 8), we observed the existence of the Noala built with reed materials and covered with the hay in the territory of the khmis ksiba commune, which are used as guard and leisure housing.



Figure 8: The Noala is Covered with the Reed and the Hay in Doukkala East.
Source: Field work, 2023.

3.3.5 The Manzah housing

The Manzah (local name) is a distinctive traditional rural housing in the areas of Doukkala, associated with influential persons, or those who had authority in the government in ancient time, such as the family of the Tounsy kayd, or who had an important social place in Doukkala area. The manzah is also associated with scholars who are known for Islamic jurisprudence, such as the jurist Ben Rhaili in Doukkala east. The manzah refers to the walking as the person climbs to the second layer or floor of the manzah for the walking and see his private property.

The manzah housing (figure 9) in that period reflects the socio-economic situation of the person within the society of Doukkala. The manzah housing is built from local materials of limestone, the soil, the cement, the iron, it is paved inside and outside with clay mixed sand, the roof is covered with the wood, clay, sand and the cement. The thickness of the walls of the manzah varies between 40 and 50 centimeters, and consists of two layers (lower and upper room). The staircase is built on the side of the lower room to climb to the upper room characterized with spacious space for shelves and windows.



Figure 9: The Manzah Housing is Built by the Tounsy kayd family in Doukkala East. Source: Field work, 2024.

In fact, the manzah housing exists in Doukkala area, but it is exposed the degradation as it has abandoned and not maintained and preserved. The manzah is considered a tangible heritage which needs the preservation.

3.3.6 The Zawiya housing

The Zawiya is a religious, scientific and social establishment rooted in Moroccan society. The Zawiya used in multiple purposes such as achieving social peace, solidarity, economy, medicine, and the study of Islamic jurisprudence such as the Zawiya Tounsiya.

The Zawiya Tounsiya is located in the Aounate tribe which is a territorial commune in province of Sidi Bennour, about 33 km east of the city of Sidi Bennour. The Zawiya Tounsiya was founded in the twelfth century (1126/1714) by the sheikh Tounsy Ben Mbarak.

The Zawiya Tounsiya was built with local materials such as limestone and soil. The exterior and interior walls were paved by the clay mixed with the sand, and the roof was covered by the wood. This zawiya consists of rooms to accommodate students, school, bookcase, and the jurist housing.

The Zawiya Tounsiya (figure 10) in that period constituted a collective housing as it had 100 rooms to accommodate students in order to study the sciences of language, grammar, the science of the Quran and everything that preserves the origins of Arab Islamic culture. Actually, this zawiya used as a collective housing by the grandson of Sidi Ahmed El Tounsy, where they spend religious and family occasions and leisure time which might take place weekly or monthly. These celebrations or occasions belong to zawiya in everything.



Figure 10: The Zawiya Tounsiya is a Collective Housing in the Tribe of El Aounate.
Source: Field work, 2023.

The religious and scientific function of the zawiya have disappeared due to the absence of efforts to preserve this zawiya by the grandson of the Tounsy family and the state. Not only the absence of efforts but also modern schools appeared which led to

leaving Zawiya and enrolling in modern education. The zawiya is exposed degradation and neglect by the grandsons of Sidi Ahmed El Tounsy. It is a tangible heritage in Doukkala area that needs preservation to be sustainable heritage for the future generation.

3.3.7 The French colonial housing

Doukkala was an area of attraction and settlement for the French colonists during the Protectorate period in Morocco. They settled in places with agricultural potential. These colonizers practiced the Bour cultural and the cattle such as: the colonialist Meneuze, Genin, Bertar, Jelmoud, and Fautaine. The French colonizers built rural housing associated with the farms with a local folkloric character.

The French colonialist "Fautaine" is an example in the eastern part of Doukkala area (figure 11), exactly in the basin of the Aouja valley, and he was exploiting farming agricultural of about 583 hectares. The colonialist built a rural housing in the farm agricultural consisting of a group of rooms, the stores rooms, and the equipment rooms. This housing was built with local materials of soil, limestone, and thick walls ranging between 40 and 50 centimetres tiled with mud mixed with the sand, and a roof consisting of local materials such as the wood, the Reed plant, and the soil or the dust, and surrounded by a thick wall between 40 and 80 centimeters, also tiled with mud mixed with the sand to protect the house. After Morocco independence and the departure of the colonialist Fautaine, the state reclaimed the exploitation farm, part of which was distributed to farmers and the rest part was planted with eucalyptus trees, and the forest guard became the occupant of the French colonial housing.



Figure 11: The French Colonial Housing is a Built in Doukkala Eastern Part.
Source:Field work, 2024.

This housing is a tangible heritage built with local materials, but it has been neglected and only a few traces remained due to the absence of efforts to preserve the French colonial housing. So, it must be preserved for future generations as a very important aspect of culture and history of Morocco.

3.3.8 The traditional housing

Doukkala area is characterized by a variety of forms of architectural traditional housing according to the building materials used. We distinguish between three forms of traditional housing: The first form is earthen plaster brick housing whereas the second one is limestone housing. However, the third one is schist stone housing.

- **Earthen plaster brick housing**

The brick housing is a traditional housing built from the bricks made from local earthen plaster, (figure 12). This housing is diffused in some the douars such as the douar of Ouled Taleb. The brick housing is used by humans and animals. This housing is traditionally built and requires local skills in construction operations. The walls of the houses are characterized by a weak thickness of between 15 and 20 centimetres whereas the roof is covered by light materials such as reeds, the wood and the plastic with a layer of dust. However, the walls are tiled internally and externally with the same building materials. The brick housing consists of sleeping rooms, kitchen, and toilet. This housing does not require neither the cement, the iron, nor the supports in the construction operations.



Figure 12: The Brick Housing is Diffused in the Douar Ouled Taleb in Doukkala Area. Source: Field work, 2024.

The brick housing is characterized by poor resistance to natural conditions such as the precipitation, and is also characterized by the fragility of the materials, especially the bricks made from the flood soil. This housing needs to be maintained and controlled continuously.

- **The Limestone housing**

The limestone housing (figure 13) is considered the most diffused in Doukkala area, built with white-collared lime stone. Its walls are built with limestone stones tightened with the soil. The thickness of the walls varies between 40 and 50 centimeters. This type of housing does not need supports or tiling sometimes, especially the exterior face of the wall, and the interior walls are tiled either with the mud mixed with the sand, cement mixed with the sand. The limestone housing consists of bedrooms, kitchen, the storage rooms, the stables, and one entrance for humans and animals. The roof is made with reeds, wood and plastic with a layer of soil, iron, sand and gravel mixed with the cement.

The limestone housing was built without recourse to documents or design by an architect, but built according the decisions and engineering of the local population. This housing is built with limestone stones that reflect the local environment or the milieu as these limestone stones are either extraction locally or importation from other areas. This housing is built by people who are specialized in the construction "The Maalam (local name that refers to a professional person)" and his assistants. This housing is built according to the available materials.

Actually, the limestone housing has undergone an important transformation in construction materials as the roof is made with cement and iron materials whereas the walls are built with cement bricks and sand. There is also an integration of the local and non-local materials or the transformations towards to modern housing. These factors have impacted on the traditional housing which results in losing the identity and the local specificity. The limestone housing is characterized by robustness, resistance and sustainability, and housing adaption to climatic conditions.



Figure 13: The Traditional Housing is Built by the Limestone Stones in Doukkala Area. Source: Field work, 2024.

▪ **The Schist stone housing**

The housing built with gray-coloured schist stones are considered the least defused in Doukkala area as it is defused in limited spaces, especially in the eastern part of the Doukkala area along the Rhamna plateau. The schist housing (figure 14) is built with schist stones mixed with clay. It is characterized by thick walls ranging between 40 and 50 centimeters, and the roof covered by the reeds, wood, and a layer of soil, or cement and iron that are used in the roof and the walls. The latter is paved with cement and sand. The exterior face of the walls does not need tiling or supports of the construction. This housing is built by a specialized person in the schist stone construction (The Maalam) and his assistants. The schist housing is characterized by solidity, sustainability, and resistance to natural conditions such as the precipitation. The schist housing is similar to limestone housing in terms of geometric form function. It reflects the impact of the local environment, because the schist stone is a locally extraction material.



Figure 14: The Schist Housing is built by Locally Extraction Stones in Ouled Jarrar part.

Source:Field work, 2024.

The schist housing is a tangible heritage built by local materials, but in the actually period, the local population is transformation to modern housing built from non-local materials, despite the complexity of the legal process of obtaining building permits.

3.4 The fragile rural housing: characteristics and typologies

The fragile Rural housing is built from materials such as reeds, hay and tree branches. This housing is widespread in the Doukkala area. This housing, on the one hand, is associated with socio-economic factors such as poverty and lack of materials. On the other hand, security factors are associated with guarding agricultural exploitation. However, the legal factors are the refusal of public authorities to grant building permits which result in resorting to the use of fragile materials as an alternative solution. The fragile rural housing is characterized by diverse characteristics in terms of forms, geometry, materials, and function.

3.4.1 The Laazib housing

The Laazib (local name) is a fragile housing, which has spread in Doukkala area. The Laazib is associated the phenomenon of pastoralism during the seasons of the year. The Doukkala area is known since ancient times for its pastoral-agricultural activity with poor resources, so that the laazib housing is element of the strategies of the farmer drawing on the cattle activity for to reduce from the risk such as the deficiency of the pasture. The Laazib housing is used as a shelter for humans and the cattle, and we distinguish two different types of the Laazib:

- **The Temporary laazib housing**

The temporary laazib (figure 15) is associated with specific periods of time during the year especially when there is the deficiency pasture in the exploitation associated with the fundamental housing. The farmer moves the cattle to another exploitation characterized by the pasture abundance by either individual or collective the property. The farmer built laazib housing by mixed local materials such as reeds, wood, fences, and built the corral or "The Zriba" (local name) for the cattle, and a place or house for the shepherd. According the terrain observations, the temporary laazib is most spread in summer especially in the east of Doukkala area.



Figure 15: The temporary Laazib Housing is Built with the Corral and House of the Shepherd.

Source:Field work, 2024.

- **The Permanent laazib housing**

The permanent laazib is characterized by the permanent stability which is built far from the fundamental housing. The laazib is built by the solidity materials such as limestone, schist or bricks; sometimes it is built with fragile materials such as reeds, wood, and sider (*Ziziphus spina-christi*). This housing (figure 16) is associated with some structures and equipments such as the corral, the well, and the hay pile. The farmer is linked to the laazib housing in daily movements between the fundamental housing and the laazib housing.



Figure 16: The Permanent Laazib Housing is Built with Fragile Materials and Linked to the Well.

Source:Field work, 2024.

3.4.2 The Aacha housing

The Aacha (local name) is a fragile housing similar to the Noala housing in terms of the construction; it is built with mixed materials such as reeds and tree branches. The roof is covered with straw or plastic. The aacha housing is classified as temporary or permanent. The aacha is inhabited by one or two persons either permanently or temporarily for guarding the agricultural exploitation. The aacha is built in agricultural exploitation that is far from the fundamental housing to control or protect the cultivation from planting to harvesting. The construction of the aacha reduces the moves between the fundamental housing and the agricultural exploitation in the rural areas. The aacha housing (figure 17) can be transformed into a permanent or fundamental housing when it is provided by a well and its equipments such as solar panels in case the person is obligated live in the aacha permanently to guard the well and practices the agricultural activity. According the terrain observations, we confirm that the aacha is the most spread during the spring and summer season in Doukkala area.



Figure 17: The Aacha Housing is Built with Mixed Fragile Materials in Doukkala East.

Source: Field work, 2024.

3.4.3 The Fades housing

The fades housing (figure 18) has transformed from cities to rural areas; it is built from different materials such as tin, wood, bricks, and plastic. The fades housing is inhabited by one person or a family. It is sometimes associated with a specific activity such as selling building materials or equipments of wells. According the terrain observations, many persons built the fades housing so that they faced difficulties in obtaining a building permit from the local authorities. In this case, the person initiates the construction of the fades housing as a camouflage for local authorities.



Figure 18: The Fades Housing is Built with Mixed Materials in Doukkala East.
Source:Field work, 2024.

The fades housing consists of bedroom, reception room, kitchen, the storage, the stables, and some tree planting. This housing is characterized by the faiblesse resistance to natural conditions such as the precipitation and the temperature, and needs constant maintenance and control.

3.5 Characteristics and Typologies of architectural rural housing modern and transformations in the Doukkala area

The architectural modern housing is widespread in the Doukkala area, and is associated with the economic, social, spatial... factors. This housing is built from modern's materials such as cement, cement bricks, iron... this housing is characterized by several characteristics in terms of form, geometry, building materials and the function.

3.5.1 The container housing

The container housing is spread in Doukkala area, and is associated with the amelioration of the economic and social conditions. The container consists of one room equipped with air conditioning and fossil electricity or solar energy. The characteristics of the container housing are the transformation facility and resistance of the natural conditions such as precipitation and wind. This housing (figure 19) is inhabited by one person or more for guarding the agricultural exploitation or controlling plants from

growth to harvest. The container housing is used by the rich people since it is very expensive when compared to the Noala or the aacha housing in the construction costs.



Figure 19: The Container Housing is Built in the Farm of Ben Sahraoui in Doukkala East.

Source:Field work, 2024.

3.5.2 The Modern housing

Doukkala area has witnessed economic and social transformations which were manifested in architectural rural housing. The transformation from the traditional housing to modern housing built either with a mixture of local and non-local materials or built with non-local materials such as cement bricks, sand, and iron. This housing (figure 20) is characterized by thin walls ranging between 15 and 20 centimeters. The walls are paved from the inside and outside to resist precipitation. However, the roof is built with cement, iron, and sand. The modern housing consists of either one or two layers with a terrace for drying clothes. It also contains a bedroom, reception, and kitchen. This housing does not require a large area for construction which sometimes does not exceed 100 m² compared to the limestone housing or the traditional housing, which may exceed 1000 m².



Figure 20: The Modern Housing is Built with two Layers in the agricultural exploitation. Source:Field work, 2024.

The modern housing is built either by local population or non-local individuals settling in cities for leisure. It is often surrounded by either a cement brick wall or an iron fence and tree plantations. It is also equipped with surveillance cameras. The function of this housing is limited to shelter only and sometimes is not related or unattached to the stables. Through terrain observation in east Doukkala, we have noticed that modern housing has begun to spread in the rural areas of Doukkala, and has become juxtaposed to traditional housing.

3.5.3 The Modern sophisticated housing

The modern sophisticated housing is associated with rich persons; it is classified in the bragging housing manifesting the social level of the person or the status of the person in the local society of Doukkala. This type of housing has become spread in the Doukkala area, built by either local residents or from other regions; it takes villas or palaces and luxury decorations. The modern sophisticated housing is either built with mixed components that are local or non-local materials; it consists of one layer and decorated with gypsum and tiles. This housing contains rooms, sitting room, bathrooms, cistern, private well, private guard and various plants. The modern sophisticated housing (figure 21) is surrounded by a wall built either of stones or bricks. The person may settle in this housing permanently. The person's moves to the housing might be weekly or monthly.



Figure 21: The Modern Sophisticated Housing is built by Ben Sahraoui in the agricultural exploitation.

Source: Field work, 2024.

The Doukkala area has witnessed a dynamic in architectural rural housing (figure 22), and the result is an integration of traditional and modern housing in the douars of the Doukkala area.



Figure 22: Integration between architectural rural housings in the douars.

Source: Field work, 2025.

4 Discussion and contribution

The area of Doukkala is known by three typologies of architectural rural housing which are traditional, fragile and modern:

- The architectural traditional housing is characterized by its diversity in terms of form, geometry and building materials which was used by the populations of Doukkala for multiple functions. This housing, including the Tazota and toufri, is now an architectural heritage that is used as a tourist attraction for its economic,

social and spatial implications. However, the old traditional housing has been exposed to negligence and deterioration.

- The fragile housing is built from fragile materials such as reeds, tree branches and straw and is classified as temporary housing. This housing is used for multiple functions such as guarding, the nomadic, and selling some agricultural materials or building materials and as a person housing. The fragile housing is widespread in Doukkala area such as the aacha and the laazib housing, but it had been exposed to degradation causes due to natural factors and the nature of the fragile materials
- In brief, Doukkala area has witnessed the transformations in the architectural rural housing. The local population is transferred towards the modern housing built with the local materials or non-material. This mutation is associated with multiple factors:
 - The amelioration of the economic and social situation of Doukkala population.
 - Doukkala benefited from the hydro-amenagement project in 1950, which practiced the cultivation of value-additional such as sugar beet, alfalfa.
 - The emergence of the well irrigation or exploitation of the phreatic table, which practiced the cultivation of value-additional such as alfalfa, onions, potatoes, tomatoes, the miller.
 - Internal and external migration, these migrants build modern housing or transform traditional housing to modern housing as a result of their ameliorated social status.
 - The emergence of secondary housing built by persons living in cities.
 - The emergence of local actors who invested in Doukkala and built luxurious housing.

These factors have contributed to the transitions towards architectural modern housing and relative abandonment of traditional housing. The shift toward modern housing has several economic, social and environmental drawbacks such as reducing agricultural space and agricultural production in the rural area of Doukkala.

The architectural rural housing faces some constraints such as the tazota and Toufri housing that have been exposed to deterioration and demolition. The absence of the maintenance and preservation of traditional housing heritage in Doukkala area is another factor. The state intervention was limited to preserving some Tazotas that are used in tourist attractions. The architectural of modern rural housing also faces several constraints such as the complexity of the process of obtaining a building permit from public authorities, but in this case, the local populations opt for the fades housing or the secret building in the rural of Doukkala area.

This study contributes to enriching academic research as there is an absence of scientific articles and studies that refer to all typologies of architectural rural housing in English. This study constitutes a fundamental base for local geographers interested in subjects related to rural housing, architectural heritage, and rural tourism.

This study contributes to the importance of preserving architectural rural housing as a material-cultural heritage that has economic, social and identity value. The state must preserve this architectural heritage as it is a crucial part in the sustainable development of Morocco. We hope this study has been a real contribution in a way or another to shed some lights on this material culture.

5 Conclusion

Doukkala area has an interesting diversity of architectural rural housing which varies in terms of form, geometry, and materials used in the construction and the available conditions. The environmental, economic, and social conditions provide an indispensable factor in the diversity and the geographical distribution of the housing in Doukkala area. The housing plays multiple roles such as sheltering humans and animals and practicing various functions including industry, agriculture. The local population has created innovative housings such as Tazota, Toufri, Manzah and modern sophisticated housing.

The tazota, Toufri and the Noala are example of these housings, because they require the local skills in the construction process. Moreover, they are built with original local materials which reflect the local and rural environment such as the limestone. In fact, this housing attracts tourists as it is a very important architectural heritage.

At the end of this study, I suggest some recommendations:

- Preserving the heritage of architectural rural housing as a part and parcel of sustainable development
- Reconstructing the dilapidated houses.
- Sensitizing the local population to the importance of preserving the heritage of architectural rural housing.
- Valorising the heritage of architectural rural housing through making Tazotas and Toufri attractive destinations for tourists.
- Encouraging rural tourism to explore the heritage of architectural rural housing through providing suitable services near those destinations
- Controlling the expansion of modern housing construction.
- Preventing the construction of modern rural housing at the expense of agricultural space

List of abbreviations:

- R.G.P.H: Recensement général de la population et de l'habitat.
- M.H.U.A.E: Ministère de la l'habitat de l'urbanisme et de la l'aménagement de l'espace

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Povzetek

Regija Doukkala se nahaja v osrednjem Maroku. Zanja je značilno polsuho podnebje. Glede na razvoj jo delimo na štiri prostorske enote: del Oulja zaznamuje intenzivno namakalno kmetijstvo, ki temelji na vodnjakih; del Sahel temelji na pašni živinoreji; ravninski del temelji na namakalnem kmetijstvu v dolini reke Oum Errabia; jugovzhodni rob pa se opira na samooskrbno kmetijstvo (Bour), ki je odvisno od padavin. Doukkalo naseljuje devet plemen, ki živijo v sožitju z naravnim okoljem. Ta plemena so oblikovala različne tipe podeželskih bivališč, ki se razlikujejo po obliki, materialih, geometriji in funkcijah.

Regijo Doukkala zaznamujejo trije tipi podeželske arhitekture. Prvi tip je tradicionalna arhitekturna podeželska hiša, zgrajena iz lokalnih materialov in znanj. Primeri so bivališča Tazota, Toufri, Manzah, francoska kolonialna hiša, Zawiya, Noala in šotor Kayma. Ti tipi bivališč predstavljajo otipljivo kulturno dediščino območja Doukkala. Drugi tip je »krhka« arhitektura, zgrajena iz nestabilnih materialov, kot so trstika, seno in veje; tovrstna bivališča (Aacha, Laazib, Fades) so začasna. Tretji tip pa predstavlja sodobna arhitektura, zgrajena iz lokalnih in nelokalnih sodobnih materialov, kot so cement, betonske opeke in železo. Ta tip se vse bolj vključuje v tradicionalna in krhka bivališča po vaseh (douarih). Primeri vključujejo sodobno hišo in kontejnersko hišo.

Regija Doukkala je doživela dinamičen prehod v arhitekturnem razvoju, saj se lokalno prebivalstvo vse bolj usmerja k sodobnim oblikam bivališč. Ta prehod je povezan z izboljšanjem gospodarskega in socialnega položaja prebivalcev Doukkale.

Namen te študije je prispevati k mednarodnim akademskim razpravam, saj primanjkuje znanstvenih člankov v angleščini, ki bi obravnavali vse tipe podeželske arhitekture. Študija poudarja pomen ohranjanja podeželske arhitekture kot materialno-kulturne dediščine z gospodarsko, družbeno in identitetno vrednostjo. Maroška država bi morala bolj zaščititi to dediščino in spodbujati razvoj podeželskega turizma za doseganje trajnostnega razvoja.

Mednarodna poletna šola *Quality of Life in a Changing World*

Od 24. avgusta do 3. septembra 2025; Maribor, Slovenija

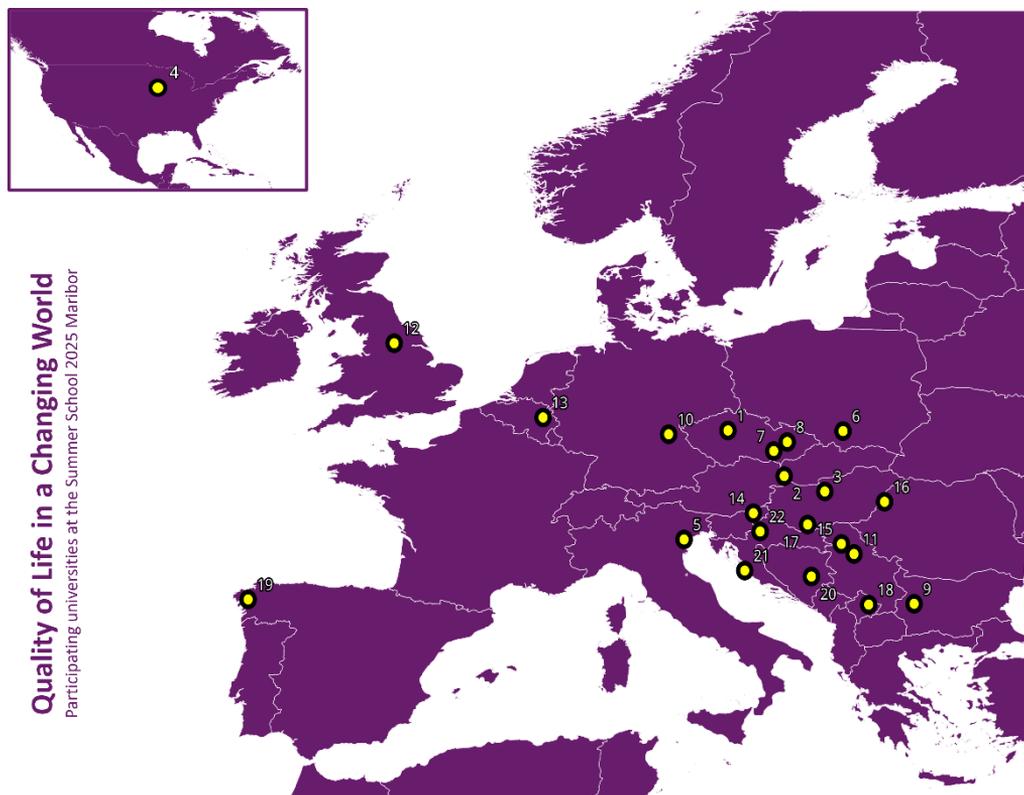
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Na Oddelku za geografijo Filozofske fakultete Univerze v Mariboru je med koncem avgusta in začetkom septembra 2025 potekala mednarodna poletna šola *Quality of Life in a Changing World*. Dogodek je povezal več kot 55 študentov ter več kot 15 profesorjev in strokovnjakov z 22 partnerskih univerz iz petnajstih držav. Glavni poudarek je bil na interdisciplinarnem proučevanju kakovosti bivalnega okolja v spreminjajoči se družbi in prostoru. Takšna zasnova je udeležencem omogočila povezovanje teoretičnih predavanj in terenskega raziskovanja ter spodbujala medkulturno izmenjavo in timsko delo. Dogodek je organiziran v sklopu programa Erasmus+ in CEEPUS GEOREGNET mreže. Celoten program vključno z gradivom je dostopen na spletni strani poletne šole: sites.google.com/view/geosummerschoolmb.



Slika 1: Lokacije sodelujočih univerz s katerih so prihajali predavatelji ter študenti.

Vir: Avtorja, 2025.

1	Karlova univerza	12	Univerza v Leedsu
2	Univerza Komenskega v Bratislavi	13	Univerza v Liègu
3	Univerza Corvinus v Budimpešti	14	Univerza v Mariboru
4	Državna univerza v Iowi	15	Univerza v Novem Sadu
5	Univerza IUAV v Benetkah	16	Univerza v Oradei
6	Jagelonska univerza v Krakovu	17	Univerza v Pécsu
7	Mendelova univerza v Brnu	18	Univerza v Prištini
8	Univerza Palackega v Olomoucu	19	Univerza v Santiagu de Compostela
9	Univerza svetega Klimenta Ohridskega v Sofiji	20	Univerza v Sarajevu
10	Univerza v Bayreuthu	21	Univerza v Zadru
11	Univerza v Beogradu	22	Univerza v Zagrebu

Preglednica 1: Seznam sodelujočih univerz (številke ustrezajo lokacijam na zemljevidu na prejšnji strani).

Vir: Avtorja, 2025.

Program poletne šole

V skladu z Erasmus+ KIP (Kombinirani intenzivni program) se je program poletne šole začel z dvema spletnima dogodkoma, ki sta bila izvedena 5. in 12. junija 2025. Predavanja in aktivnosti, ki so jih izvedli profesorji in strokovnjaki z univerz ter Statističnega urada RS so omogočili priprave na dogodek v živo in vpogled v izbrane teme iz kakovosti bivanja.

1. Peter Kumer: From Green Infrastructure to Geogames: Introduction to the Summer School Programme
2. Uroš Horvat: Slovenia and Maribor
3. Manca Šuštar: Quality of the living environment from the EU-SILC perspective
4. Gregor Zupan: Digitalization: How digital tools and access to technology impact daily life, services, and community engagement
5. Danijel Davidović: Workshop on One-Minute GeoSpotlight: Share Your Happy Place
6. Giuseppe Borruso: Connected Cities: Transport, Port-Urban Links & Quality of Life
7. Alenka Poplin: Serious geogames - How can they contribute to the Quality of Life?
8. Alenka Poplin: Workshop on Serious geogames

Program, ki je potekal v živo na Univerzi v Mariboru pa se je začel v nedeljo, 24. avgusta 2025, z registracijo udeležencev in mednarodnim študentskim sejmom, na katerem so udeleženci predstavili svoje države z njihovimi kulinaricnimi in drugimi kulturnimi posebnostmi. Dogodek je bil hkrati priložnost za neformalno spoznavanje in vzpostavljanje prvih vezi med vsemi udeleženci.

Sledil je uvodni dogodek, ki je bil namenjen slavnostnim nagovorom:

- Joca Zurc, prodekanica za mednarodno dejavnost in promocijo FF UM,
- Uroš Horvat, predstojnik Oddelka za geografijo FF UM,

- Lučka Lorber, namestnica vodje Centra za zaslužne profesorje in upokojene visokošolske učitelje Univerze v Mariboru,
- Mojca Ješe, Mednarodna pisarna FF UM,
- Peter Kumer, glavni organizator,

V nadaljnjih dneh se je odvil program, ki je bil zasnovan kot razgiban preplet predavanj, delavnic, terenskega dela, strokovnih ekskurzij in raziskovalnega dela v sodelovanju z mentorji.

Predavanja in delavnice

Predavatelji s partnerskih univerz in strokovnjaki z različnih ustanov so interdisciplinarno osvetlili teme kakovosti bivalnega okolja, prostorskega načrtovanja, socialne vključenosti, podnebnih sprememb in vloge znanosti v družbi.

1. Eberhard Rothfuss: Reflections of Philosophical Anthropology (H. Plessner) on "Well-being" in the city and the countryside
2. Danijel Ivajnsič: Spatial analysis of climate change impacts
3. Monika Murzyn-Kupisz: Museums, social capital, creativity and quality of life
4. Éva Máté: Coping with spatial isolation in rural areas – Life quality in perforated villages
5. Eberhard Rothfuss: "Urban Atmospheres" – Why they matter & and how we can investigate them
6. Silva Grobelnik Mlakar: BIOSHIELD: Novel Biotechnological Solutions in Climate Change Mitigation
7. Maria Chiara Tosi: Welfare Spaces in contemporary city
8. José Ignacio Vila Vázquez: Urban regeneration and social inclusion in marginalized housing estates and fragmented neighborhoods (lecture)
9. José Ignacio Vila Vázquez in Aránzazu Pérez Indaverea: Urban regeneration and social inclusion in marginalized housing estates and fragmented neighborhoods (workshop)
10. Živa Novljan: Quality of Life in the Alps: Insights into the 10th Report on the State of the Alps
11. Aránzazu Pérez Indaverea: Digital media and our relationships with other (human) beings
12. Serge Schmitz: Blue, green, brown, dark and happiness corridors in the city (lecture)
13. Serge Schmitz: Blue, green, brown, dark and happiness corridors in the city (workshop)
14. Lučka Lorber: The Role of Universities in a Long-Lived Society
15. Jarosław Działek: Urban public spaces and the quality of life: towards more liveable cities
16. Pavel Ptaček: Demographic change and quality of life: the concept of smart ageing
17. Tilen Kolar: Everyday Queer Mobilities

Predavanja so dopolnjevale delavnice z razpravami in raziskovalnim delom v manjših skupinah, kjer so se udeleženci urili v interpretaciji prostorskih pojavov in razvijali lastne ideje za izboljšanje kakovosti življenja v različnih okoljih.

Terensko delo in ekskurzije

Terensko delo je predstavljalo pomemben del poletne šole, saj so študenti pridobili neposredne izkušnje z opazovanjem, doživljanjem in interpretacijo prostora v različnih delih Slovenije.

1. Ekskurzija v Ljubljano je bila namenjena spoznavanju koncepta zdravih mest in trajnostnega urbanizma. Udeleženci so te tematike raziskovali v dveh skupinah:
 - Krater Ljubljana – eksperimentalni urbani prostor na območju nekdanje industrijske površine, kjer je narava spontano prevzela prostor. Deluje kot živi laboratorij za trajnostnost mesta, ki spodbuja krožno gospodarstvo, ekološko regeneracijo in skupnostne projekte.
 - Jane's Walk po središču Ljubljane – sprehod pod vodstvom strokovnjakinje iz Inštituta za prostorske politike. Pot je vodila od železniške postaje skozi Tabor do Ljubljaničice in Slovenske ceste, s poudarkom na prometni, turistični in stanovanjski preobrazbi mesta v zadnjih desetletjih.
2. Ekskurzija v severovzhodni Sloveniji je obravnavala primere trajnostnosti, urbanih preobrazb in lokalnih inovacij. Program je zajemal tri glavne postanke:
 - Mednarodni center za samooskrbo – učno središče za sonaravno pridelavo, obnovljive vire energije in trajnostne bivalne prakse, ki ponuja vpogled v zmanjševanje okoljskega odtisa in krepitev odpornosti skupnosti.
 - Mesto Celje – tretje največje slovensko mesto, kjer so udeleženci spoznavali projekte urbane prenove, okoljske izzive in strategije izboljševanja kakovosti življenja v postindustrijskem mestu.
 - Posestvo Sočni raj – primer povezovanja trajnostnega kmetijstva in turizma, ki prikazuje, kako lahko podeželska območja ohranjajo kulturne in ekološke vrednote ter hkrati razvijajo inovativno podjetništvo.

Obe ekskurziji sta študentom omogočili primerjavo urbanih in podeželskih pristopov k izboljšanju kakovosti življenja ter povezavo teoretičnih vsebin s konkretnimi primeri trajnostnih praks.

Raziskovalne skupine

Osrednji del poletne šole je predstavljalo raziskovalno delo v interdisciplinarnih skupinah, ki so pod mentorstvom domačih in tujih strokovnjakov obravnavale različne vidike kakovosti bivalnega okolja v urbanem in podeželskem prostoru. Delo je obsegalo pregled literature, terenske ogleda in zbiranje podatkov, analize in skupinske razprave ter pripravo končnega poročila.

Študenti so bili razdeljeni v raziskovalne skupine, ki so jih vodili navedeni mentorji:

1. Environmental Change and Spatial Analytics – Danijel Ivajnsič
2. Permaculture as Independent Living – Ana Vovk Korže
3. Urban Agriculture and Quality of Life – Silva Grobelnik Mlakar
4. Ecological Network and Ecosystem Services – Nicola Sanda
5. Urban Atmospheres and Human-Centred Urban Planning – Eberhard Rothfuss
6. Welfare Spaces – Maria Chiara Tosi
7. Social Inclusion, the Commons and Production of Public Spaces – José Ignacio Vila Vázquez
8. Emotional Mapping of Transport Infrastructure – Tilen Kolar
9. Discussing Development Opportunities of Perforated Rural Settlements with a Special Focus on Life Quality – Éva Máté, Pavel Ptaček

10. Assessing the Quality of Urban Public Spaces – Jarosław Działek, Monika Murzyn-Kupisz

Vsaka skupina je pripravila svoje zaključno poročilo – prispevek k skupni znanstveni monografiji. Tako so študenti aktivno prispevali k razumevanju prostorskih, družbenih in okoljskih razsežnosti kakovosti življenja v Mariboru in tudi širše.



Slika 2: Pozdravni nagovor župana občine Celje.
Vir: Avtorja, 2025.



Slika 3: Mednarodni študentski sejem.
Vir: Avtorja, 2025.



Slika 4: Popoldansko predavanje o vlogi medijev pri družbenih odnosih.
Vir: Avtorja, 2025.



Slika 5: Oglad posesti Sončni raj in prigrizek po celodnevni ekskurziji.
Vir: Avtorja, 2025.

Kulturni in družabni program

Poleg strokovnih vsebin je poletna šola vključevala raznolik kulturni in družabni program, ki je potekal skozi celoten čas trajanja in spodbujal medkulturno povezovanje ter sproščeno izmenjavo izkušenj.

Udeleženci so se ob začetku srečali na zabavi, ki so ga pripravili člani ESN Maribor v klubu Trust. V naslednjih dneh so spoznavali Maribor na vodenem ogledu mesta, obiskali Hišo stare trte z degustacijo vin, se povzpeli na Piramido, udeležili kino večera in poletne zabave v MC Pekarna.

Med vikendom je bil organiziran športno-rekreativni dogodek Summer School Paddle Adventure, kjer so udeleženci veslali po reki Dravi med Pohorjem in Kozjakom ter spoznali naravno okolje Maribora z drugačne perspektive.

Zaključek

Mednarodna poletna šola je povezala izobraževanje, raziskovanje in medkulturnost, spodbudila kritično razmišljanje o kakovosti bivalnega okolja ter okrepila sodelovanje med partnerskimi univerzami. Udeleženci so pridobili izkušnje, ki bodo dragocene pri njihovem nadaljnjem študiju in kariernem razvoju.

Zahvala

Dogodek je bil izveden s finančno podporo programov Erasmus+ in CEEPUS (mreža GeoRegNet). K izvedbi poletne šole so veliko pripomogli tudi študenti Oddelka za geografijo s svojim prostovoljnim delom. Organizatorji se zahvaljujejo banki Delavska hranilnica za finančno donacijo in podjetjema Radenska in Atlantic Droga Kolinska za donacijo brezalkoholnih pijač.



Slika 6: Radovedni študenti pri skupinskem delu na eni od delavnic, ki je potekala v amfiteratru dr. Vladimirja Bračiča.

Vir: Avtorja, 2025.



Slika 7: Prizor z Jane's walk / Urbanega sprehoda, ki je v sklopu prve ekskurzije potekal skozi ljubljansko Metelkovo.

Vir: Avtorja, 2025.



Slika 10: Rekreativna aktivnost po raziskovalnem delu z veslanjem po Dravi.

Vir: Avtorja, 2025.



Slika 11: Obisk Mednarodnega centra za samooskrbo v Poljčanah v sklopu druge ekskurzije.

Vir: Avtorja, 2025.



Slika 8: Prva skupinska fotografija udeležencev pred Filozofsko fakulteto UM.
Vir: Avtorja, 2025.



Slika 9: Degustacija lokalnega vina pri Hiši stare trte po vodenem ogledu
Maribora.
Vir: Avtorja, 2025.

Mednarodna konferenca QGIS

Od 2. junija do 4. junija 2025; Norrköping, Švedska
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Od 2. do 4. junija 2025 je v mestu Norrköping na Švedskem potekala mednarodna QGIS uporabniška konferenca (*QGIS User Conference 2025*), ki je združila okoli 300 uporabnikov, razvijalcev, raziskovalcev in izobraževalcev s področja prosto dostopnih geografskih informacijskih sistemov z vsega sveta. Dogodek, ki sta ga organizirala Švedska QGIS uporabniška skupina v sodelovanju s QGIS.org, je predstavljal osrednje letno srečanje skupnosti, ki razvija in uporablja odprtokodno programsko opremo QGIS za prostorske analize, kartografsko vizualizacijo, raziskovanje prostora in izobraževanje.

Konferenca je obsegala predavanja, predstavitve primerov dobrih praks in praktične delavnice, ki so obsegale tako tehnične kot uporabniške vidike dela s QGIS programom. Med osrednjimi temami so bile novosti v prihajajočih verzijah, integracija programa z orodji za umetno inteligenco in spletno kartografijo, lidar podatki in 3D vizualizacija, uporaba programa pri okoljskih, podnebnih in prostorskih analizah, razvoj vtičnikov in podatkovnih struktur ter pedagoški pristopi pri poučevanju GIS. Več o programu je dostopno na spletni strani dogodka: uc2025.qgis.org.

Poleg krajših enournih delavnic, ki so potekale med programom, je bilo organiziranih več poglobljenih večurnih delavnic. Med njimi je bila tudi delavnica *Data collection with Mergin Maps and QGIS*, v sklopu katere so predstavili in demonstrirali mobilno aplikacijo za terensko delo, ki je združljiva s programom QGIS. Več informacij o aplikaciji je dostopno na spletni strani: merginmaps.com.

Del programa je potekal v sodobnem Visualiseringscenteru C, interaktivnem središču za vizualizacijo podatkov, digitalno umetnost in znanost. Udeleženci so lahko tam spoznali napredne pristope za prikazovanje prostorskih podatkov, uporabi virtualne resničnosti ter povezovanju geografskih informacij z umetnostjo in komunikacijo. Ustanova izpostavlja pomen vizualizacije kot mostu med znanstvenimi podatki, prostorsko analitiko in znanstveno komunikacijo za splošno javnost. Ponudba in ostale informacije o centru za vizualizacijo so dostopne na spletni strani: visualiseringscenter.se.

Udeležba na konferenci je omogočila vpogled v najnovejše trende prostorske analitike in razvoja prosto dostopnega GIS programa, izmenjavo znanja z razvijalci in uporabniki iz različnih držav ter povezovanje z mednarodno QGIS skupnostjo.

Zahvala

Obisk konference je finančno podprla Univerza v Mariboru v sklopu projekta Učinkovito izobraževanje za zeleni in digitalni prehod.



Slika 1: Udeleženci konference.
Vir: QGIS User Conference, 2025.



Slika 2: Dinamičen in interaktiven prikaz izbranih značilnosti mesta Norrköping.
Vir: Avtor, 2025.



Slika 3: Digitalni globus kot del izobraževalne infrastrukture Visualiseringscenteru C.
Vir: Avtor, 2025.



Slika 4: Del programa je potekal na Univerzi Linköping.
Vir: Avtor, 2025.



Slika 5: Sestanek razvijalcev po koncu konference za uporabnike.
Vir: QGIS User Conference, 2025.

Terenske vaje na Dunaju v sklopu predmeta Regionalna geografija Evrope

Od 28. junija do 30. junija 2025; Dunaj, Avstrija

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Študenti 3. letnika dodiplomskega študijskega programa geografija so v okviru predmeta *Regionalna geografija Evrope* izvedli tridnevne terenske vaje na Dunaju. Po triurni vožnji do Dunaja je sledila panoramska vožnja po mestu, ki je potekala mimo številnih znamenitosti. Vožnjo so spremljala zanimiva pojasnila o razvoju mesta in njegovi vlogi.

Drugi dan so se študenti s profesorjem dr. Matznetterjem z Inštituta za geografijo in regionalne raziskave z Univerze na Dunaju odpravili na raziskovalni sprehod. Pod vodstvom lokalnega geografa so se poglobili v zgodovinski razvoj mesta, njegove naravne determinante in prostorsko umestitev, urbano strukturo ter sodobne izzive, s katerimi se mesto sooča. Popoldne so obiskali Prirodoslovni muzej, kjer so spoznavali bogato zbirko naravoslovnih eksponatov in geografskih vsebin. Razdeljeni v manjše skupine so pripravili interaktivne predstavitve o izbranih temah iz muzejskih razstav in tako povezali teoretično znanje s praktičnimi izkušnjami. Pri tem so razvijali sposobnosti interpretacije, timskega dela in strokovnega predstavljanja geografskih vsebin.

Pozno popoldne so študenti v manjših skupinah raziskovali različne dele mesta. Ena skupina je opazovala rabo prostora in arhitekturno dediščino v mestnem jedru, druga je spoznavala ureditev in pomen parka Schönbrunn, tretja je doživljala alternativne mestne četrti in njihove storitvene dejavnosti, četrta pa je kartirala primere zelenomodre infrastrukture.

Zadnji dan so študenti Dunaj spoznavali še z druge perspektive, tako da je del skupine raziskal živalski vrt, drugi del pa je opazoval rabo prostora vzdolž reke Donave med vožnjo z ladjo. Popoldne je sledil povratek v Maribor.

Terenske vaje so prispevale k razumevanju zgodovinske in sodobne vloge Dunaja in Donave v Srednji Evropi. Tridnevno mednarodno doživetje je študentom omogočilo celovito povezovanje teoretičnega znanja z neposrednimi izkušnjami ter boljše razumevanje kompleksnih odnosov med naravnimi in družbenimi dejavniki v konkretnem prostoru.



Slika 1: Cerkev svetega Frančiška Asiškega ob Donavskem kanalu, kjer se stikata zgodovinski in sodobni Dunaj.

Vir: Pozdrec, 2025



Slika 2: *Iguanodon bernissartensis* – Okostje rastlinojedega dinosavra iz bogate paleontološke zbirke Prirodoslovnega muzeja na Dunaju.

Vir: Pozdrec, 2025



Slika 3: Stefanova katedrala v središču mesta kot ena izmed glavnih znamenitosti in simbol Dunaja.

Vir: Jager, 2025



Slika 4: Avstralske koale v dunajskem živalskem vrtu, najstarejšem delujočem živalskem vrtu na svetu.

Vir: Jager, 2025



Slika 5: Del skupine bodočih geografov med raziskovanjem Dunaja.
Vir: Davidović, 2025

Terenske vaje v Novi Gorici in Gorici

11. 4. 2025, Nova Gorica in Gorica, Slovenija

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V sklopu predmeta *Socialna in kulturna geografija* (nosilec: doc. dr. Peter Kumer) smo se študenti 2. letnika geografije skupaj s tremi tujimi študenti programa Erasmus+, dne 11. 4. 2025, udeležili terenskih vaj v Novi Gorici in Gorici. Pri omenjenem predmetu smo obravnavali tematike in problematike slovenske zamejske skupnosti v Italiji. Na samih terenskih vajah se nismo osredotočili samo na zamejske Slovence, temveč tudi na življenje prebivalcev na slovenski strani meje in vpliv obmejne lege na njihovo vsakdanje življenje. Terenske vaje so bile namenjene analizi čezmejnih interakcij in prostorskega obnašanja ljudi, preučevanje kulturne in jezikovne raznolikosti, družbeno-prostorske spremembe in razvoj mesta Nova Gorica, preučevanju pomena naziva evropske prestolnice kulture za mesto ter uporaba sodobnih metod geografskega raziskovanja.

Dan smo pričeli v prostorih Xcentra, kjer so nam podrobneje predstavili projekt *GO! Evropska prestolnica kulture (EPK)*. Predstavniki so predstavili tudi projekte, ki sovpadajo s projektom in se odvijajo tudi izven Nove Gorice ali Gorice. Po predstavitvi smo razpravljali o pomenu skupnega projekta evropske prestolnice kulture za obe mesti in za zamejske Slovence na italijanski strani meje.



Slika 1: Predstavitev projekta GO! V Novi Gorici.
(Vir: asist. Danijel Davidovič, 2025)

Po predstavitvi projekta EPK smo se odpravili do makete Nove Gorice, kjer smo spoznali nastanek mesta. Šlo je za urbanističen in političen eksperiment po koncu

druge svetovne vojne in sporočilo Italiji, da se Slovenci Gorici ne bomo odpovedali. Novo Gorico je urbanistično zasnoval Edvard Ravnikar kot parkovno mesto z nasadi vrtnic.



Slika 2: Oglad makete Nove Gorice.
(Vir: asist. Danijel Davidović, 2025)

Tretji del terenskih vaj je hkrati osrednji del, saj smo se študenti razdelili v skupine in v posameznem delu mesta anketirali mimoidoče prebivalce Nove Gorice. Ankete smo opravili s pomočjo aplikacije *ArcGIS Survey 123*, na kateri je bila naložena naša kratka anketa. Vprašanja v anketi so se nanašala na vsakdanje življenje anketirancev, vpliv bližine italijanske meje na njihove življenjske okoliščine ter njihov odnos do aktualnih razmer na obmejnem območju. S pristopom in številom anketirancev nismo imeli posebnih težav. Po anketiranju v Novi Gorici smo se odpravili na drugo stran meje v Gorico. Mejo smo prečkali na Trgu Evrope, ki je simbol prijateljstva med mestoma. V Gorici smo se razdeljeni po skupinah, odpravili v različne dele mesta, kjer smo ponovno anketirali mimoidoče prebivalce. Na italijanski strani smo imeli nekaj več težav, saj v določenih delih mesta ni bilo veliko ljudi. Ljudi smo navadno nagovarjali v angleščini, kar pomeni, da smo imeli veliko težav s komunikacijo in pristopom do njih.



Slika 3: Skupinska slika na *Trgu Evrope*, ki je na meji med Italijo in Slovenijo.
(Vir: asist. Danijel Davidović, 2025)

Zadnja postaja terenskih vaj je bila samostan Kostanjevica, ki leži na hribu nad Novo Gorico. Z vrha Kostanjevice smo lahko uživali ob pogledu na mesto in naravno okolico (Sabotin, dolina Soče in Sveta gora), nato pa smo si ogledali cerkvico, ki se imenuje Kapela. Pod oltarjem Kapele se nahaja grobnica zadnjih treh francoskih kraljev Burbonske dinastije, ki smo si jo tudi ogledali. Poleg cerkvice se nahaja še Škrabčeva knjižnica, v kateri hranijo okoli 16.000 knjig v 25 jezikih. Med najdragocenejšimi deli pa je prva slovnica slovenskega jezika avtorja Adama Bohoriča z naslovom *Articae horulae* (Zimske urice), ki vsebuje tudi avtorjevo posvetilo. Na vrtu, za katerega skrbijo prebivalci samostana, je zasajena zbirka osemdesetih vrst vrtnic burbonk, kar jo uvršča med največje zbirke v Evropi in svetu. Nova Gorica je znana kot mesto vrtnic, zato ta simbol najdemo tudi v mestnem grbu.



Slika 4: Pogled s Kostanjevice na Novo Gorico. V ozadju se bohotijo (od leve proti desni) Sabotin, Sveta gora in Banjšice.
Vir: Nina Tivadar, 2025.



Slika 5: Oltar cerkvice Kapela.
Vir: Nina Tivadar, 2025.



Slika 6: Burbonska vrtnica s Kostanjevice pri Novi Gorici.
Vir: Nina Tivadar, 2025.

Terenske vaje smo zaključili z refleksijo. Vsak študent je zapisal kratek komentar o vtisih s terenskih vaj. Študenti geografije smo dobili vpogled v vsakdanje življenje ljudi v Gorici in Novi Gorici. Pri tem smo ugotovili, da obstajajo kulturne razlike med njima, da imajo ljudje na italijanski strani manj znanja slovenščine, medtem ko večina ljudi na slovenski strani dobro govori italijanski jezik. Spoznali smo, da je zgodovina na tem območju pustila velik pečat na ljudeh, vendar si prebivalci Nove Gorice prizadevajo za medkulturno sodelovanje, kar se kaže pri raznih dogodkih znotraj projekta EPK. Študenti smo na terenu spoznali sodobno metodo raziskovanja v geografiji, in sicer anketiranje s pomočjo aplikacije *ArcGIS Survey 123*, kar se nam je zdelo zelo uporabno in zanimivo. Terenske vaje so nam omogočile tudi interdisciplinarno povezovanje z drugimi predmeti, kot so na primer zgodovina, sociologija in angleščina.

Mariborski geograf v osrčju Iowe: raziskovalni obisk na Iowa State University

Od 13. septembra do 8. novembra 2025; Ames, Iowa, ZDA

Marko Fišer

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Septembra 2025 sem se odpravil na osemtedenski raziskovalni obisk na Iowa State University, ki se nahaja v mestecu Ames v zvezni državi Iowa. Regija spada v t. i. »Midwest«, ki je znan predvsem po kmetijstvu. Takšen občutek človek dobi že takoj, ko se pelje iz prestolnice Iowe (Des Moines) proti Amesu – koruzna polja na ravnini do koder seže tvoj pogled. Na raziskovalni obisk sem se odpravil ob podpori organizacije ASEF, ki vsako leto izbranim študentom podeli štipendijo za raziskovalni obisk v tujini (večinoma v ZDA), del sredstev pa je dodal tudi Javni štipendijski, razvojni, invalidski in prežिवninski sklad RS. Program poteka tako, da študent gostuje pri slovenskem strokovnjaku, ki dela na tuji univerzi. V mojem primeru sem gostoval pri profesorici Alenki Poplin, zaposleni na *College of Design* prej omenjene univerze. Namen mojega raziskovalnega obiska je bil povezan predvsem z magistrskim delom, v katerem sem preko kvantitativne analize prostorskih podatkov in indikatorjev, satelitskih posnetkov ter geografsko obtežene regresije analiziral mestna toplotna otoka dveh mest – Maribor v Sloveniji in Ames v ZDA ter ju povezal z demografskimi podatki (starostne in/ali socialne skupine) in izdelal projekcije scenarijev glede na podnebne spremembe za prihodnost. Vendar je bil moj raziskovalni obisk veliko več kot to, saj sem se poleg tega udeleževal predavanj na različnih študijskih smereh (npr. GIS programiranje in avtomatizacija, Osnove oblikovanja iger), obiskoval javna predavanja gostujočih profesorjev, sklepal nova prijateljstva, sodeloval kot prostovoljec na lokalnem umetniškem festivalu in se udeleževal različnih dogodkov ter druženj. Še eden pomemben namen mojega obiska je bil širjenje slovenske kulture in izmenjava znanja na mednarodnem nivoju ter hkrati krepitev odnosov in povezanosti slovenske skupnosti po svetu.

Ames, ki ima okoli 65.000 prebivalcev (od tega je kar 30.000 študentov) in kampus univerze sta me navdušila. Mesto je umirjeno in urejeno, ljudje so prijazni, veliko je mednarodnih študentov. Preko raziskovalnega obiska sem lahko tudi primerjal koncepte univerz v Sloveniji in ZDA. V Sloveniji namreč univerze (in s tem fakultete) ležijo v urbanih središčih, v ZDA pa imajo koncept kampusa, ki deluje kot mini samostojno mesto. Osrednji del kampusa Iowa State University je parkovno urejen odprt prostor, obdan z akademskimi stavbami. Sama urejenost spodbuja interdisciplinarnost ter ustvarja občutek skupnosti in pripadnosti, kar je še ena velika razlika v primerjavi s slovenskimi univerzami. Kampus ima veliko zelenih površin, vse

akademske stavbe so hitro dostopne, celotno območje kampusa pokrivajo tri brezplačne avtobusne linije, študentom so omogočene različne oblike rekreacij in aktivnosti znotraj kampusa, številni lokalni festivali in študentske organizacije organizirajo veliko dogodkov in druženj.

Kot izziv na tej univerzi, v primerjavi s slovenskimi, bi izpostavil administrativne postopke, dokumentacijo in komunikacijo – predvsem pri samem vstopu v ZDA, ki je včasih lahko počasnejše in zapleteno oz. količinsko nakopičeno (ne pa vedno), ter dostop do nekaterih podatkovnih virov. Vendar ameriški sistem spodbuja visoko produktivnost in čim bolj stalno prisotnost, sam sem na predavanjih opazil, da se veliko manj poslužujejo frontalnega pristopa predavanj in s vključevanjem študentov v okrogle mize, debate in druge oblike spodbujajo kreativnost. Prav tako bi izpostavil večjo integriranost geografskih informacijskih sistemov (GIS) v študijski proces, saj imajo študentje Iowa State University brezplačen dostop do licenciranih programov (npr. ArcGIS Pro), znotraj kampusa imajo namensko poslopje za geoinformacijsko znanost, kjer se izvajajo predavanja, vaje in projekti.

Raziskovalni obisk na Iowa State University mi je omogočil poglobljanje svojega znanja in dragocen vpogled v ameriški sistem ter njihovo mentaliteto. Sicer nisem živel v velikem mestu, ki bi mi najverjetneje prikazalo drugačno sliko, ampak ta izkušnja mi bo ZDA pustila v lepem spominu in jo priporočam vsakemu – majhno, zeleno, prijazno, umirjeno, a hkrati živo univerzitetno mesto, ki je prostor družbenih kontrastov in hkrati občutka pripadnosti.



Slika 1: Fotografija avtorja, profesorice Alenke Poplin in profesorja Dejana Valentinčiča (raziskovalca na obisku).
Vir: avtor, 2025



Slika 2: Avtor pred zgradbo uprave Iowa State University.
Vir: avtor, 2025



Slika 3: Osrednji del kampusa (v času fotografiranja je potekal lokalni festival hrane).

Vir: avtor, 2025.



Slika 4: Center mesta Ames (v času festivala umetnosti).

Vir: avtor, 2025.



Slika 5: Udeleženci ekskurzije v Des Moines, kjer je potekala javna razprava o prenovi avtobusnih linij.

Vir: avtor, 2025.



Slika 6: "Studio" - prostor v katerem se študent srečujejo, učijo ali delajo naloge.

Vir: avtor, 2025.

Zahvala

Študijski obisk Državne univerze v Iowi sta omogočila fundacija ASEF in Javni štipendijski, razvojni, invalidski in preživninski sklad Republike Slovenije.

Potovanje v Španijo: Izkušnja raziskovalnega bivanja v Galiciji

Od 23. februarja do 8. marca 2025, Santiago de Compostela, Španija

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Potovanja so zame način, kako spoznavati svet in hkrati sebe. Rada odkrivam nova okolja in se preizkušam v novih stvareh. Konec februarja 2025 sem se odpravila v Španijo, kjer sem dva tedna bivala v mestu Santiago de Compostela. Mesto leži na skrajnem severozahodu države, v Galiciji in je znano predvsem po stolnici svetega Jakoba, ki je končni cilj znane romarske poti Camino de Santiago.

V Santiago de Compostela sem odpotovala v okviru Individualnega študentskega raziskovalnega izziva Univerze v Mariboru (IŠRI:UM). Namen mojega potovanja je bilo raziskovanje uspešnih strategij urbane kolesarske infrastrukture v galicijskih mestih in nabiranje primerov dobrih praks. Poleg Santiaga sem s tem namenom raziskovala tudi v drugih galicijskih mestih, kot so Vigo, A Coruña in Pontevedra. Vsako mesto me je navdušilo na svoj način in skupaj so mi dala zelo dober vpogled v to, kako razmišljajo o trajnostni mobilnosti. Pri raziskovanju mi je pomagal tudi tamkajšnji profesor Jose Ignacio Vila Vazquez, ki je bil odličen sogovornik in mentor.

Najprej sem obiskala mesto Pontevedra, ki leži ob izlivu reke Lézé v Atlantski ocean. V starem mestnem jedru je tam motorni promet zelo omejen, zato je okolje tam zelo mirno in tiho, kar po navadi za mesta nismo navajeni. Mesto A Coruña mi je bilo še posebej všeč, saj združuje neposreden stik z oceanom, prekrasne razgledne točke in prijetno vzdušje. Ima urejen sistem izposoje koles Bicicoruña, ki deluje po celotnem mestu. Kolesarska infrastruktura je varna, dobro označena in povezana, kar povečuje izposajo koles. Mesto Vigo je pristaniško mesto z živahnim utripom. Tam sem tudi sama preizkusila izposajo električnega kolesa, ki se je odlično obnesla. Parkirišča za ta kolesa so na voljo ob avtomobilskih parkiriščih v parkirnih hišah, kar je odličen primer spodbujanja multimodalnosti in uporabe koles. Z izposojenim kolesom sem si tako lahko ogledala velik del mesta in se zapeljala celo do tamkajšnje peščene plaže. Santiago de Compostela je mesto, ki me je navdušilo s svojo naravno in kulturno dediščino. Po velikosti in številu prebivalcev je primerljivo z mestom Maribor, zato sem se tam hitro počutila domače. Galicijska mesta so nasploh trajnostno naravnana in prijetna za življenje. Veliko zelenih površin, kolesarskih stez in pešpoti ter urejenih javnih prostorov.

Še en izmed nepozabnih dogodkov celotne izkušnje je bilo potovanje s hitrimi vlaki med mesti. Menim, da so tamkajšnje povezave odlične, saj je bila pot z vlakom vedno hitra, zanesljiva in udobna, zaradi česar so bila potovanja med mesti pravi užitek. To potovanje mi je prineslo veliko novih izkušenj in pogledov na trajnostno urejanje mest. Čeprav je bil to predvsem študijski obisk, je predstavljal tudi potovanje, ki mi je dalo veliko izkušenj, lepih spominov in željo, da kmalu spet kam odpotujem.

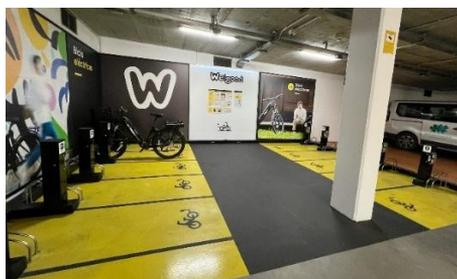


Slika 1: Gostitelj Jose Ignacio Vila Vazquez, profesor na Univerzi v Santiagu de Compostela.
Vir: Avtorica, 2025



Slika 2: Pogled na mesto A Coruña iz griča Monte de San Pedro.

Vir: Avtorica, 2025



Slika 3: Postaja za izposajo električnega kolesa v mestu Vigo.

Vir: Avtorica, 2025



Slika 4: Sistem izposoje koles Bicicoruña v mestu A Coruña.

Vir: Avtorica, 2025

Zahvala

Študijski obisk na Univerzi Santiago de Compostela je omogočil program IŠRI:UM (Individualni študentski raziskovalni izzivi Univerze v Mariboru). Mobilnost sta podprla domači mentor Peter Kumer z Univerze v Mariboru in Jose Ignacio Vila Vazquez – mentor na gostujoči univerzi.

Od Maribora do Budimpešte: krajša CEEPUS GeoRegNet izmenjava na Madžarskem

Od 17. 3. do 7. 4. 2025; Budimpešta, Madžarska

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Kot študent nepedagoške geografije in pedagoške sociologije na Univerzi v Mariboru sem se spomladi 2025 v okviru programa CEEPUS odpravil na krajšo, tritedensko izmenjavo v Budimpešto. Tam opravil obvezno prakso z raziskovanjem dnevne mobilnosti študentov in profesorjev na Corvinus univerzi ter oblike mobilnosti, ki so na voljo med fakulteto in drugimi konci mesta.

Cilj, ki sem si ga zadal pred potjo je bil, da izvem čim več stvari o javnem prometu v Budimpešti, kaj uporabljajo ljudje za prevoz na delo, za prevoz v šolo, kaj jih moti, kaj bi izboljšali, kako bi to izboljšali itd. Želel sem tudi raziskati mobilnostne navade v mestu in seveda pridobiti čim več izpolnjenih vprašalnikov za magistrsko nalogo s

strani profesorjev in študentov (njihove odgovore bom bom primerjal z Univerzo v Mariboru, kjer so podobno raziskavo že izvajali v preteklosti).

Budimpešta me je pozitivno presenetila s svojo kombinacijo bogate zgodovine in modernega urbanega življenja. Sprehod ob Donavi, arhitekturne znamenitosti in živahne ulice so ustvarile prijetno vzdušje, ki je spodbudilo raziskovanje in druženje. Prav tako sem opazil, da mesto ponuja širok spekter kulture in kulinarike, kar je še dodatno obogatilo mojo izkušnjo. Javni prevoz je kljub nekaterim izzivom razmeroma učinkovit in omogoča enostaven dostop do različnih delov mesta.

Glede na svojo izkušnjo priporočam Budimpešto kot destinacijo za študentske izmenjave. Je kraj, kjer lahko hitro spoznaš novo kulturo, se naučiš novega o mestni mobilnosti in doživiš mnoge zanimivosti, ki jih ponuja prestolnica Madžarske. Poleg študijskih možnosti je to tudi priložnost za osebno rast in vzpostavljanje novih prijateljstev.



Slika 1: Most svobode v Budimpešti
Vir: avtor, 2025.



Slika 2: Obisk živalskega vrta
Vir: avtor, 2025.



Slika 3: Glavna železniška postaja v Budimpešti
Vir: avtor, 2025.

Menim, da je takšna krajša izmenjava odlična za študente, saj lahko v kratkem času spoznajo tujo kulturo, tuje navade, se naučijo kaj novega in doživijo nekja novega, sklenejo nova prijateljstva, hkrati pa se lahko ogromno naučijo in s tem dobijo praktične izkušnje, ki ti v življenju vedno koristijo. Predvsem pa sem velik zagovornik

tega, da morajo študenti tekom študija veliko raziskovati, potovati in izkoristiti trenutke, ki so jim praktično ponujeni/podarjeni, saj je to eden izmed najlepših trenutkov življenja in vsaka zamujena priložnost je izgubljena priložnost za rast, spoznavanje sebe in sveta. Kot je dejal znani geograf Yi-Fu Tuan: »Kraj ni le točka na zemljevidu, ampak izkušnja usidrana v spomin.« Zato so potovanja in izmenjave ključne, da študenti razumejo svet ne le kot zemljepisno dejstvo, temveč kot živo in dinamično mrežo odnosov, kultur in zgodovin, ki bogatijo naš pogled in znanje.

Vzpostavili smo skupnosti učni vrt Radela

8. 11. 2025, Dobrava pri Radljah ob Dravi; Slovenija
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Osnova za vzpostavitev vrta je *Načrt skupnostnega in učnega vrta RADELA*, ki predstavlja celovito strokovno podlago za vzpostavitev skupnostnega in učnega vrta v Dobravi pri Radljah ob Dravi. Načrt združuje pridelovalne, izobraževalne in terapevtske dejavnosti ter temelji na permakulturnem pristopu, ki območje razporedi v cone – od intenzivnih zelenjavnih gred do sadovnjaka, trajnic, biodiverzitetnih travnikov in gozdnega roba.

Predlog zajema ureditev dveh lokacij: vrtička ob hiši ter večjega travnika, ki se preoblikuje v osrednji skupnostni vrt. Predvidene so ogljikove grede, dvignjene grede brez prekopavanja, sadno-jagodičaste zasaditve, zeliščni koticiki, prostori za meditacijo, semenska knjižnica, kompostniki ter informacijski/učni prostor. Načrt vključuje tudi fazno izvedbo projekta skozi leto 2025 – od prvih zemeljskih del in postavitve gred, do zasaditev, izobraževanj, vključevanja lokalne skupnosti in priprave programov.

Poseben poudarek dokument namenja ekosistemskim storitvam, zgodovinski rabi prostora, samooskrbi ter povezovanju različnih generacij in organizacij. Skupnostni vrt RADELA je zasnovan kot dolgoročen center pridelave, učenja, druženja in promocije trajnostnega življenjskega sloga. Urejanje vrtička smo zaključili 8. novembra 2025.



Slika 1: Vzpostavljanje skupnega vrta v Dobravi pri Radljah ob Dravi.

Gostujoči predavatelji na Oddelku za geografijo v letu 2025

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Maribor; Slovenija

V letu 2025 smo na Oddelku za geografijo gostili vrsto strokovnjakov iz raziskovalnih ustanov, univerz in osnovnih ter srednjih šol. Predstavili so aktualne teme s področja geografije, pedagoškega dela, prostorskih analiz ter družbenih in okoljskih izzivov. Gostujoča predavanja so študentom ponudila vpogled v različne geografske poklice, sodobne raziskovalne pristope in globalne geografske tematike, obogatila pa so tudi sodelovanje našega oddelka z domačimi ter tujimi institucijami. Letošnja gostujoča predavanja so zbrana v spodnji preglednici.

Ime in priimek	Institucija	Trajanje obiska	Opis predavanja
Melita Vidovič	Zavod Republike Slovenije za šolstvo, Slovenija	19. 3. 2025	Predstavila je delovanje ZRSŠ s poudarkom na projektih in možnih oblikah vključevanja (bodočih) magistrstov profesorjev geografije.
Mateja Krumpak	II. gimnazija Maribor, Slovenija	2. 4. 2025	Predstavila je delovanje šole z vidikov vodstva, dinamiko dela na področju gimnazijskega geografskega izobraževanja in zahteve trga dela v izobraževanju.
Nina Simonič	Gimnazija Ptuj, Slovenija	7. 5. 2025	Predstavila je svojo profesionalno pot od magistrerija na Filozofski fakulteti Univerze v Mariboru do sedanje zaposlitve, področja dela na Gimnaziji Ptuj in aktualne projekte.
Yücel Dinç	Univerza Hatay Mustafa Kemal, Turčija	5. 5.-9. 5. 2025	V okviru programa Erasmus+ za visokošolske učitelje je pripravil predavanje z naslovom Turistično-poslovna območja v turških obmorskih letoviščih.
Silvija Zeman	Medžimursko visoka strokovna šola v Čakovcu, Hrvaška	19.-20. 5. 2025	Pripravila je predavanje z naslovom Težke kovine v tleh na Hrvaškem. Predstavila je tudi rezultate dela specializiranega laboratorija, ki ga imajo za analize tal in izpostavila kritično obremenjena območja. Predavala je tudi o možnostih fitoremediacije.
Saleh Sidmustafa	Gibanje Polisario, Zahodna Sahara	22. 5. 2025	Organizacija predavanja je potekala v sodelovanju s Pekarno Magdalenske mreže Maribor. V svoji predstavitvi je orisal zgodovino in sodobne izzive Zahodne Sahare. Predstavil je zgodovino dekolonizacije regije, ki sega v obdobje španske kolonialne vladavine, in podrobneje proces, ki je po umiku Španije leta 1975 privedel do maroške okupacije in trajnega spora o samodeterminaciji Saharavijev.
Alenka Poplin	Državna univerza v Iowi, ZDA	11. 6.-11. 7. 2025	V okviru Gostovanja slovenskih strokovnjakov iz tujine na slovenskih

			visokošolskih zavodih in raziskovalnih organizacijah, ki ga financira Javni sklad Ad Futura je izvedla predavanje Resne digitalne geografe – kako lahko prispevajo h kakovosti življenja. Za študente je izvedla tudi delavnico na temo resnih geografov.
Tilen Kolar	Univerza v Leedsu, Združeno kraljestvo	30. 8.-21. 9. 2025	V okviru programa Vabljeni strokovnjaki iz praks Univerze v Mariboru je izvedel predavanje z naslovom Vsakodnevne kvir mobilnosti. Organiziral je tudi simpozij in delavnico na temo kartiranja LGBTQ+ prostorov v Mariboru in širši regiji.
Tamara Draganova	Univerza svetega Cirila in Metoda v Velikem Trnovem, Bolgarija	27.-31. 10. 2025	V okviru programa Erasmus+ za visokošolske učitelje je imela dve predavanji in sicer Uporaba infografik pri poučevanju geografije ter Miselni vzorci kot učni model za študente.
Ferim Gashi	Univerza v Prištini, Kosovo	24.-28. 11. 2025	V okviru programa CEEPUS GeoRegNet je opravil kratek obisk za namen poučevanja. Imel je dve predavanji: Geoprostorske tehnologije za trajnostni razvoj in Metodologije urbanega in regionalnega planiranja.
Branka Roškar	Osnovna šola Radlje ob Dravi, Slovenija	26. 11. 2025	Izvedla je pedagoško delavnico Actionbound.
Mojca Ilc Klun	Osnovna šola Mirana Jarca Ljubljana, založba Rokus Klett, Slovenija	26. 11. 2025	Predstavila je interaktivne učbenike za pouk geografije v osnovni šoli s poudarkom na možnostih individualiziranega in diferenciranega pristopa za učence s posebnimi potrebami.
Santosh Kumar Singh in Seelam Srinivasa Rao	Univerza v Muddenahalli, Indija	27. 11. 2025	Izvedla sta predavanje o Indiji, njeni kulturi in prebivalstvu.
Tatjana Kikec	Društvo učiteljev geografije Slovenije, Slovenija	3. 12. 2025	Izvedla je pedagoško delavnico problemskega učenja s H5p ter predstavila priložnosti spletišča Uporabna geografija.

Zborovanje Združenja Ameriških geografov v Detroitu v ZDA

Od 24. do 28. marca 2025, Detroit; ZDA

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Tokratno Zborovanje Združenja ameriških geografov (AAG) je potekalo v Detroitu, ki se nahaja ob reki Detroit, ki povezuje ZDA in Kanado, in v bližini Jezera svete Klare. Prijel se ga je tudi vzdevek avtomobilsko mesto (*The Motor City*) oziroma *Motown*, kakor se imenuje tudi nekdanja kulturna založba z Detroita, ki je izdajala večinoma glasbo temnopoltih izvajalcev. V mestu je namreč v šestdesetih letih 20. stoletja cvetela ameriška avtomobilska industrija, še danes pa imajo v njem sedež trije največji ameriški avtomobilski koncerni - General Motors, Ford in Chrysler. Hitra industrializacija je s seboj prinesla veliko onesnaženje okolja in rasno segregacijo (zlasti temnopolte skupnosti, ki je tvorila pomemben delež delavcev v tovarnah). Po propadu avtomobilske industrije je prišlo do socialnih nemirov in demografskega zloma. Mesto je v primerjavi z obdobjem gospodarskega vzpona v 50. letih 20. stoletja izgubilo več kot 60 % prebivalstva – leta 2020 je to nekoč 4. največje ameriško mesto imelo komaj 639.000 prebivalcev. Prav zato je Detroit postal tudi središče aktivizma – razvila so se gibanja za državljanske pravice in rasno enakost ter gibanja za okoljsko pravičnost in močne sindikalne aktivnosti.



Slika 1: Skupina raziskovalcev, ki so predstavljali referate v sekciji z naslovom »Malleable spaces: The dynamic negotiation of identity in the margins«
Vir: avtor, 2025.



Slika 2: Downtown Detroita se bohota s širokimi avenijami in visokimi stolpnici, kjer zaradi demografskega zloma prostori pogosto samevajo.
Vir: avtor, 2025.

Zaradi turbulentne zgodovine Detroita je bila tema letošnjega zborovanja, ki je potekalo med 24. in 28. marcem 2025, »Ustvarjanje prostorov priložnosti«. Program je na primer vključeval serije predavanj o prehranski samozadostnosti črnske skupnosti, okoljski pravičnosti in soupravljanju urbanih prostorov.

Tokratnega zborovanja sva se udeležila tudi raziskovalca z ljubljanske in mariborske univerze. Boštjan Rogelj z Oddelka za geografijo Univerze v Ljubljani je sodeloval v razpravi z naslovom Geografije medijev in popularne kulture v novi dobi tesnobe.

Razprava se je osredotočala na vpliv medijev (od filma do družbenih omrežij) in popularne kulture na nove družbeno-prostorske odnose kot so vse bolj poglobljene delitve.

Jaz pa sem kot predstavnik Centra za prostorsko sociologijo Fakultete za družbene vede Univerze v Ljubljani in Oddelka za geografijo Univerze v Mariboru sodeloval v sekciji o prožnih prostorih na obrobjih, ki vplivajo na oblikovanje identitet. Skupaj s Tilnom Kolarjem z Univerze v Leedsu sva za to sekcijo pripravila prispevek z naslovom »Onkraj enklave: queer identitetna mobilnost in želja po anonimnosti v majhnih krajih«. V vlogi člana upravnega odbora posebne skupine AAG za kvalitativno geografijo (*Qualitative Research Specialty Group - QRS*) sem se udeležil tudi sestankov odbora in sekcij, ki jih je sponzorirala skupina.

Zborovanje AAG v Detroitu je uspešno izpostavilo preplet geografije z družbeno pravičnostjo, kulturo in vključevanjem skupnosti. V zadnjih letih skuša AAG vse bolj povezovati letno zborovanje z mestom, kjer poteka. Srečanje v Detroitu je postavilo pomemben precedens za prihodnja zborovanja, ki bodo skušala še bolj poudariti lokalni kontekst in vključevati skupnosti.



Slika 3: Freska Diega Rivere, ki prikazuje vzpon avtomobilske industrije v Detroitu, se nahaja v muzeju Detroit Institute of Arts.
Vir: avtor, 2025.



Slika 4: Primer bogate arhitekturne dediščine iz časov, ko je kraljeval art deco. V tem slogu so grajene stavbe iz cvetočih 20. letih 20. stoletja.
Vir: avtor, 2025.

Zahvala

Sodelovanje na Zborovanju AAG v Detroitu je omogočila podpora programske skupine P5-0181, Sociološki vidiki trajnostnega družbenoprostorskega in kadrovskega razvoja Slovenije v Evropi.

